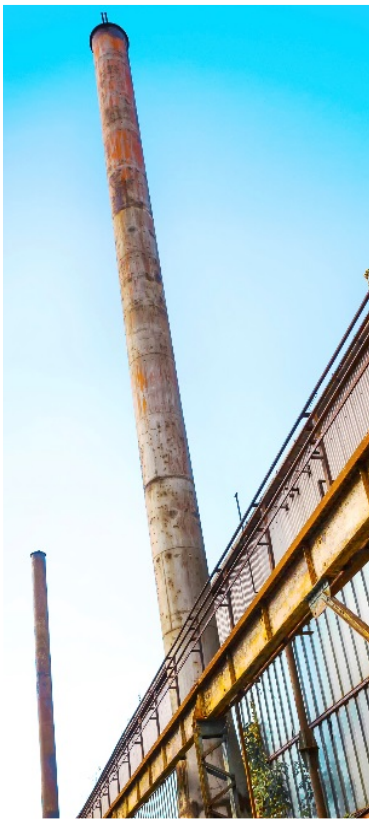
2019 Operations and Monitoring Report

for the Original Upland Landfill
Campbell River, British Columbia

Northwin Environmental



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1. Introduction

GHD has been retained by Northwin Environment Ltd. (Northwin) to prepare this 2019 Annual Operations and Monitoring Report (Annual Report) for the Upland Original Landfill (Original Landfill or landfill) located at 7295 Gold River Highway (Site) approximately 7 kilometres (km) west of Campbell River, British Columbia (BC) city centre. A Site location map is provided as Figure 1. The landfill is operating under the Operational Certificate 107689 (OC 107689), which was issued to Upland Excavating Ltd. (Upland) on August 1, 2019. A copy of the OC is provided as Appendix A. The Site is owned by Upland. The landfill is operated by Northwin.

This Annual Report provides a summary of the landfill operations carried out on-Site and the results of the environmental monitoring plan (EMP) implemented from January 1 to December 31 of 2019 (Reporting Period). An evaluation of the operational and environmental performance of the landfill is provided with recommendations made for the ongoing landfill development and the EMP.

This Annual Report has been written in accordance with the Landfill Criteria for Municipal Solid Waste (MOE, June 2016) and Section 5.4 of the OC.

1.1 Background

The Site is approximately 48 hectares in size and is accessed from the north via an entrance from Gold River Highway. Currently, the Site encompasses a large sand and gravel pit (Pit) and the Original Landfill. A Site Plan is provided on Figure 2.

Prior to the issuance of the OC, the Original Landfill operated under Permit PR-10807 (Permit). This Permit was issued for the Original Landfill on June 1, 1992. In accordance with the approved Comox Valley Regional District Solid Waste Management Plan (SWMP), Upland, being the owner of the Site submitted an application in June 2015 to replace the Permit with a new Operational Certificate.

Prior to the issuance of the OC, annual water quality monitoring results for the Original Landfill were provided to the Ministry of Environment and Climate Change Strategy (ENV) in 2017 and 2018 in response to an e-mail request from ENV to Upland and GHD dated November 10, 2017.

The OC was issued on August 1, 2019.

As shown on Site Plan A of the OC, the Original Landfill waste management area is located outside of the Pit near the southeast corner of the Site. The Original Landfill is comprised of the Original Lined Cell, Original Un-Lined Cell and Original Leachate Management Works (i.e., three leachate storage tanks), as shown on Figure 3. The OC authorizes waste discharge to the Original Lined Cell. Waste discharge to the Original Un-Lined Cell is not currently authorized.

An Operations and Closure Plan (OCP) for the landfill was submitted to the ENV on May 22, 2019. An updated OCP (Revision 1) was updated and submitted to the ENV on October 4, 2019.

1.2 Site Location

The Site is bound to the north by Gold River Highway (Highway 28), to the east by forested and industrial land parcels and to the west by Rico Lake, a construction storage yard and an undeveloped industrial lot. The southern boundary of the Site is located on the Campbell River city limit. The area to the south is part of the Strathcona Regional District and includes land parcels used by the forestry industry. The legal description of the Site is Lot A, District Lot 85, Plan 30709, Sayward District.

2. Site Operations and Development

2.1 Original Landfill

The Original Landfill includes the 85 metres (m) by 85 m Original Lined Cell, the Original Un-Lined Cell, approximately 7,000 square metres (m^2) in size, and Original Leachate Management Works. The Original Leachate Management Works are described in Section 2.2.

The Original Lined Cell was constructed with two 20 mil Coated Woven Polyethylene (CWPE) liners and is equipped with a leachate collection system and a leak detection drainage layer composed of medium sand between the upper and lower liner. The leak detection drainage layer is equipped with a perforated pipe with a riser pipe that extends to ground surface, which may be used for water level monitoring and extraction of the contained water if required.

The Original Lined Cell intermittently accepts construction and demolition (C&D) waste, land clearing debris and soil meeting applicable Contaminated Sites Regulation (CSR) industrial land use Standards, by appointment only. All accepted wastes are discharged to the Original Lined Cell and no waste is discharged to the Original Un-Lined Cell.

2.2 Original Leachate Management Works

The Original Leachate Management Works include leachate collection, extraction, storage and treatment and either on- or off-Site discharge, as appropriate based on treated effluent quality. A general schematic of the Original Leachate Management Works is provided in Figure 2.1 below, however, the exact leachate management components and processes are being developed.

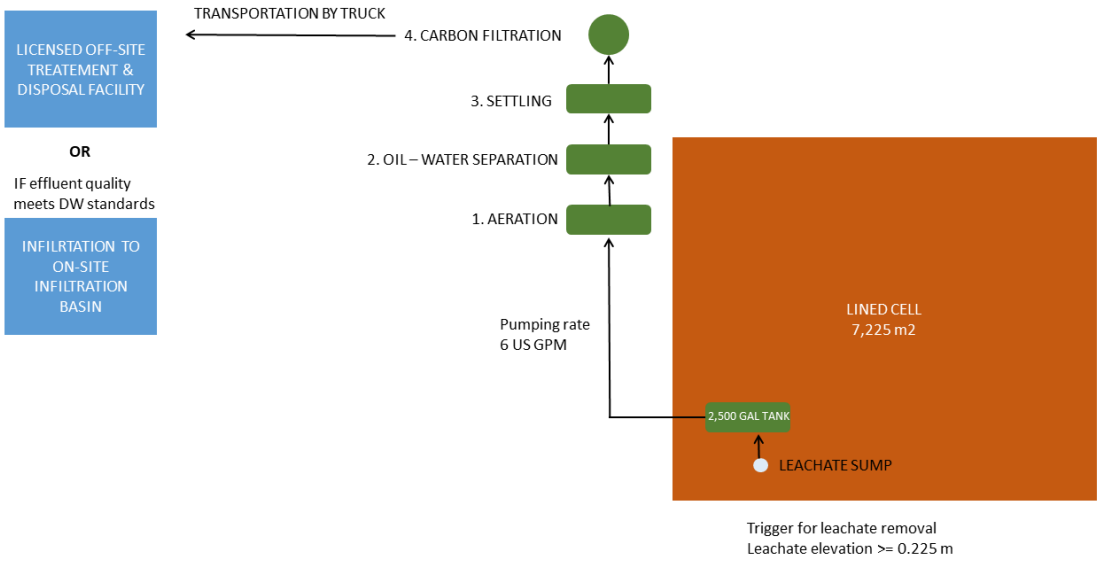


Figure 2.1 Schematic Leachate Management Works

Leachate is collected within the Original Lined Cell and drains to the leachate sumps. The location of the sumps are shown on Figure 3. Sump S05-19 was installed in 2019 including pipping and electrical to facilitate removal of leachate from the southern portion of landfill. Sump S04 will be installed in the future in the approximate location shown in the OCP.

A 2,500 US gallon (9.46 m^3) leachate collection tank is located within the northwest side of the Original Lined Cell near S03-19. Leachate from S03-19 is set to automatically drain to the 2,500 gallon collection tank. Leachate from the collection tank, as well as from S05-19 is transferred to one of the three partially buried 25 cubic metre (m^3) (6,600 US gallon) fibreglass leachate storage tanks located adjacent to the Original Lined Cell. In 2019, a 63.6 m^3 (400 fluid barrel (bbl)) steel frac tank was added adjacent to the three existing tanks to provide additional leachate storage capacity.

The on-Site leachate treatment system was under construction in 2019 and will construction continue in 2020. In 2019, the construction included the addition of a solar back-up system, a diesel generator and a gasoline generator to support leachate extraction and pumping though a flow- through system.

In 2019, leachate generated within the Original Lined Cell was collected and stored during the Reporting Period. Bench scale treatment trials were carried out, however, no treated effluent was discharged during the Reporting Period.

Following the completion of the leachate treatment testing, leachate will be treated on-Site using a batch flow through system. The three 25 m^3 tanks will provide for aeration, settling, filtration, oxidation and storage of the treated leachate.

Effluent will be sampled to determine the discharge quality. Dependent on the quality, the treated leachate will either be transported off-Site to a licensed treatment and disposal facility or discharged to an on-Site infiltration basin. Effluent that meets CSR Schedule 3.2 Standards for drinking water protection (DW) standards may be infiltrated on-Site. Effluent that does not meet DW standards will

be accepted by Tervita Corporation (Newalta) located in Nanaimo, BC, or another provincially licenced facility.

In 2019, a seacan was installed for the purpose of storing leachate treatment chemicals.

2.3 Summary of OCP Implementation

During the Reporting Period, the Original Landfill operated in accordance with the OCP, including:

- Filling – waste was accepted according to the waste acceptance policy (Sections 8.2 through 8.4 of the OCP) and discharged in the Original Lined Cell in accordance with the fill plan.
- Cover placement – intermediate soil cover was placed on non-soil waste following landfilling. In addition, in November 2019, a polyethylene tarp was placed over all areas that received waste to minimize leachate generation.
- Site signage and security – new landfill signage was erected at the main entrance of the Site in November 2019. The signage included all information specified in Section 6.10 of the Landfill Criteria.
- Float Switch in Leachate Sump S03-19 – the leachate collection sump S03-19 provides collection and extraction of leachate from the northern portion of the lined cell. The sump has been set to automatically drain the sump to the leachate collection tank utilizing a float switch.
- Installation of Leachate Sump S05-19 – the leachate collection sump S05-19 was installed to provide collection and extraction of leachate from the southern portion of the lined cell.
- Leachate collection – leachate is extracted from the landfill by active pumping from the sump S05-19, and the leachate collection chamber to a 6,600 gallon leachate storage tank.
- Original Leachate Management Works – construction of the leachate management works for leachate generated within the lined cell was carried out in 2019.

2.4 Significant Works and Construction Reports

As defined in Section 2.1 of the OC, the significant works applicable to the Original Landfill include the Original Lined Cell, the Original Un-Lined Cell and the Original Leachate Management Works (conveyance, storage, treatment and discharge).

In 2019, one modification to the Original Landfill occurred. Leachate sump S02-17 was decommissioned and replaced by S03-19 in March 2019. No other modifications to the significant works applicable to the Original Landfill occurred. Construction activities related to the Original Landfill included the installation of leachate sump S05-19 in November 2019.

The construction of the Original Leachate Management Works began in 2019 and are scheduled to be completed in 2020. A construction report detailing the Original Leachate Management Works will be provided with the 2020 Annual Report.

No other significant works are proposed for 2020.

2.5 Waste Acceptance

Waste is accepted at the landfill by appointment only. The wastes authorized for discharge into the Original Lined Cell are listed in Section 1.1.2 of the OC and includes:

- Demolition waste
- Construction waste
- Land clearing waste
- Sludge from the Original Leachate Management Works
- Soil meeting applicable CSR industrial land use standards
- Other waste as authorized in writing by the Director

In 2019, demolition, construction, land clearing (C&D waste) and soil meeting applicable CSR industrial land use (IL) standards (clean soil) was accepted for discharge at the landfill. Creosote timbers were also accepted as C&D waste.

Prior to the acceptance of C&D waste and clean soil, the C&D waste and soil was subject to a screening process. The C&D Waste Acceptance Policy and the Soil Acceptance Policy are described in the OCP, Sections 8.2 and 8.3, respectively.

2.6 Waste Tonnage and Volume

In 2019, Upland accepted a total 6,196 metric tonnage or approximately 5,445 m^3 of waste for discharge to the Original Lined Cell.

- 121 metric tonnes of C&D waste or approximately 110 m^3 of C&D waste
- 1,477 metric tonnes of creosote timbers or approximately 2,461 m^3 of creosote timbers
- 4,598 metric tonnes of clean soil or approximately 2,874 m^3 of clean soil

The clean soil is classified as industrial quality. No hazardous waste, controlled waste, attractants, and/or recyclable material were received in 2019. Note that the conversion between waste tonnage and volume of C&D waste and soil was completed based on the apparent densities provided in the OCP – 1.1 t/m^3 for C&D waste and 1.6 t/m^3 for soil. The apparent density of creosote timbers was assumed to be 0.6 t/m^3.

2.7 Airspace Consumption

As shown in Table 2.1, from October 4 to December 31, 2019 approximately 5,445 m^3 of airspace was consumed through discharge of C&D waste, soil and creosote timbers to the Original Lined Cell. The airspace consumption analysis through to October 4, 2019, was completed as part of the OCP. The airspace consumption analysis through to December 31, 2019, was completed based on accepted total tonnages received for discharge to the Original Lined Cell from October 5 to December 31, 2019.

Table 2.1 Airspace Consumption

	Un-lined Cell (m^3)	Lined Cell (m^3)	Total Original Landfill (m^3)
Historical to Oct 4, 2019	35,000	4,446	39,446
Oct 5 thru Dec 31, 2019	0	5,445	5,445
Total Airspace Consumed	**35,000**	**9,891**	**44,891**

2.8 Remaining Site Life

Based on the geometry of the cell, the Original Lined Cell has a maximum capacity of 39,746 m^3. The remaining lifespan of the Original Landfill has been calculated based on the maximum allowable annual fill rate and the apparent density of the anticipated wastes. Existing contours are based on survey data from December 2018. The estimated apparent density of the anticipated waste is approximately 1.3 tonnes per m^3, based on average typical density of C&D waste, land clearing waste and soil. The estimated lifespan of the Original Lined Cell is less than one year.

Table 2.2 Lifespan Analysis

Year	Waste Disposal Rate – tonnes	Airspace Consumption[1] – m^3	Cumulative Waste In Place – tonnes	Cumulative Airspace Consumption – m^3
Pre-October 2019	-	-	6,540	4,446
Oct 5 2019 – Dec 31 2019	6,196	5,445	12,736	9,891
2020	38,812	29,855	51,548	39,746
Maximum Capacity				**39,746**
Airspace Available				**29,855**

1 Apparent density of 1.3 tonnes/m^3 obtained from the average of the following waste streams:
Waste soil – 1.6 tonnes/m^3
Construction and Demolition waste – 1.0 -1.2 tonnes/m^3

2.9 Leachate Quantities Collected

The annual leachate generation was estimated as part of the OCP (Section 6.2). Based on the result of the water balance model and conceptual model for the landfill, the theoretical annual generation rate is approximately 7,139 m^3.

In 2019, the landfill generated leachate only during times of active filling, as outside of these times Northwin deployed a polyethylene tarp over the landfill area to minimize leachate generation. Water shed off the tarp was not in contact with the waste and, therefore, was not treated as leachate. In 2019, Northwin collected approximately 50 m^3 of leachate which is stored within two 25 m^3 tanks. The collected leachate was not discharged. With the addition of the 63.6 m^3 frac tank, approximately 88.6 m^3 leachate storage capacity remains on-Site. Once this capacity is near reached, leachate will be discharged on or off site, dependent on the quality.

2.10 Site Non-Compliance

According to Northwin, the Site was compliant with the conditions of the OC during the Reporting Period.

2.11 Public Complaints

According to Northwin, no public complaints were received during the Reporting Period.

3. Site Physical Setting

The following section summarizes the Site setting with respect to climate, topography, stormwater drainage, geology, and hydrogeology.

3.1 Climate

Climate data was measured at Environment Canada's Campbell River Airport Climate Station (ID 1021261) located approximately 8 km southeast of the Site. Based on the available climate data, the area received 1,489.4 millimetres (mm) of precipitation in 2019 with much of the rainfall occurring between November and January.

3.2 Topography and Drainage

The Site is located on a terrace that is partially surrounded by mountainous terrain to the south and southwest. The terrace gradually slopes towards the Quinsam River located approximately 3.8 km to the southeast of the east Site boundary. The Quinsam River channel is at an elevation that is greater than 100 m below the Site. There are no defined surface water drainage courses on-Site.

Drainage within the Original Landfill area is managed according to the stormwater management plan provided in the OCP. Perimeter berms have been constructed around the lined cell footprint to ensure that precipitation that falls on the lined cell footprint remains within the lined cell. Precipitation that falls outside of the lined cell is considered clean water and infiltrates into the groundwater aquifer below the Site.

3.3 Geologic Setting

Overburden

Based on regional geologic mapping, the area in the vicinity of the landfill underwent several periods of glaciation during the Pleistocene Epoch. Vancouver Island was glaciated with ice thicknesses to 2 km. During the recession of the last glaciation approximately 14,000 years ago, glacial and glacio-fluvial sediments were deposited, and in some cases reworked and redeposited, to make up many of the present surficial deposits of Vancouver Island. These deposits consist of till that was deposited directly by glacial activity[1] and of glacial outwash composed primarily of poorly sorted, coarse-grained sand and gravel sediments deposited by glacial melt water (Greene, Scoates, and Weis, 2005; McCammon, 1977)[2].

Based on investigations completed by GHD and Site operations, the surficial geology underlying the landfill is native interbedded sand and gravel with occasional seams of sand and silty sand. Directly underlying the landfill, this unit is greater than 40 m in thickness.

[1] This till consists of larger clasts supported in a matrix of fine-grained sediment.

[2] Greene, A.R., J.S. Scoates and D. Weis, 2005. Wrangellia Terrane on Vancouver Island, British Columbia: Distribution of Flood Basalts with Implications for Potential Ni Cu PGE Mineralization in Southwestern British Columbia.

Bedrock

The Site is underlain by the Karmutsen Formation, which is part of the Wrangellia Terrane. The Karmutsen Formation consists mostly of submarine flood basalts up to 6 km in thickness.

Based on Site investigations completed by GHD, the bedrock underlying the landfill is competent igneous basalt. The surface of the bedrock is greater than 50 m below the ground surface in the Original Landfill area.

A bedrock ridge is present between Rico Lake and the Pit along the western limit of the Site. The presence of the ridge creates a surface water and groundwater flow divide. The approximate location of the watershed and groundwater flow divide is illustrated on Figure 4, 5 and 6.

3.4 Hydrogeologic Setting

In general, the geologic units identified in the previous section may be grouped into the following two hydrogeologic units:

1. A sand and gravel overburden aquifer
2. Bedrock aquifer

An unconfined aquifer exists within the sand and gravel overlying bedrock at the Site. In 2019, the water table was present approximately 38 to 44 m bgs in the vicinity of the Original Landfill. Groundwater flow is interpreted to be from northwest to southeast towards the Quinsam River. The head waters of the aquifer are from McIvor Lake in the vicinity of the Site.

This sand and gravel aquifer is a major aquifer in the region, and is identified in the BC Water Resource Atlas (2017) as aquifer 975 IIA (10). This aquifer is interpreted to be the principal groundwater flow zone at the Site. In the context of the landfill, this aquifer represents the only receptor to landfill-related groundwater quality impairments.

GHD completed single well response tests at nine wells screened within the sand and gravel aquifer. The results of the SWRTs show that hydraulic conductivity of the sand and gravel aquifer is approximately 1.8×10^{-2} cm/sec.

4. 2019 Environmental Monitoring Program

This section presents the 2019 EMP and specification sampling methodology, laboratory program, and quality assurance/quality control (QA/QC) program developed for the Site. Monitoring locations are presented on Figure 2.

4.1 Environmental Monitoring Program

The EMP was developed for the Site to assess and identify potential landfill derived impacts to the underlying aquifers, to monitor groundwater and surface water levels, and to evaluate Site regulatory compliance (Section 3.5 of the OC). The EMP consists of semi-annual monitoring at groundwater, surface water, leachate, and leak detection layer locations. The objective of each component of the EMP is provided below.

Groundwater

The objective of the groundwater monitoring program is to detect the extent and magnitude of potential landfill-derived impacts to the underlying overburden aquifer and to monitor the groundwater flow direction across the Site. Groundwater quality is monitored at three up-gradient (MW2-14, MW2A-16, MW3-14), one cross-gradient (MW10-17) and one downgradient well (MW11-19). Groundwater levels are monitored at 12 additional wells located across the Site.

Surface Water

Water levels in Rico Lake and McIvor Lake are monitored to assess the hydraulic relationship between these surface water bodies and the underlying aquifers. The water level surface elevation at Rico Lake is measured from a surface water gauge installed in the lake. The hydrometric surface of McIvor Lake is monitored by BC Hydro. GHD records the water level surface elevation from the publically available BC Hydro Data Records.

Leachate

The objective of the leachate monitoring program is to characterize leachate quality generated within the lined cell of the Original Landfill. Leachate was sampled from test pits and at leachate sump S03-19. Leachate sump S02-17 was decommissioned in March 2019 and replaced by leachate sump S03-19.

Leak Detection Layer Monitoring

The objective of the leak detection layer monitoring is to assess the water quality in the leak detection system and the potential for leachate-derived alterations to occur below the upper liner (i.e., polyethylene extension) of the lined cell. Water within the leak detection layer is monitored at S01-17. The leak detection layer is illustrated in Figure 4.1, below.

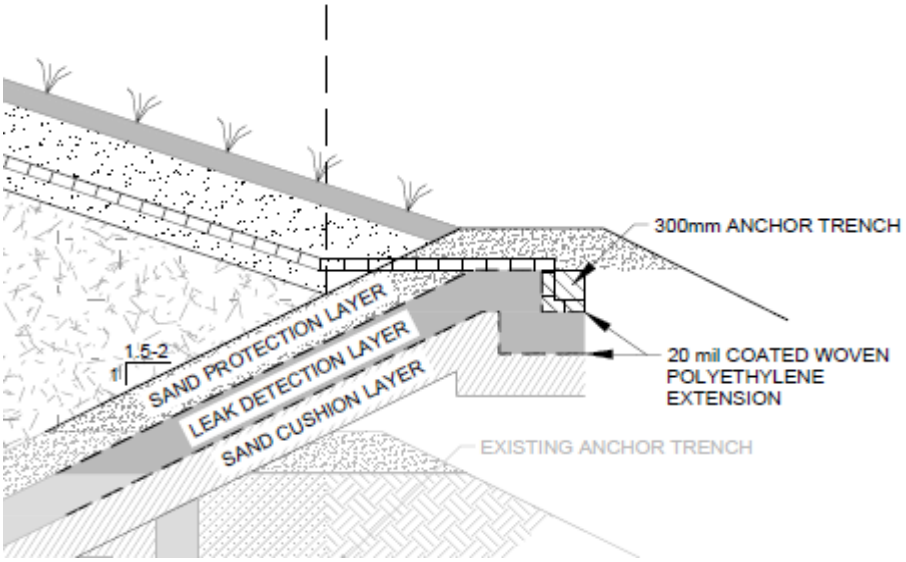


Figure 4.1 The Leak Detection Layer

EMP Specification

The EMP Specification is presented in Appendix B. The specification includes monitoring locations, frequency, and analytical parameters for each sample type. The EMP is updated based on the semi-annual monitoring results and each year's review of Site operations and environmental data as part of the Annual Report.

4.2 2019 Environmental Monitoring Program Summary

The 2019 EMP consisted of bi-annual water level, water quality and leachate monitoring occurring in May and September/October. The EMP activities included:

- Water level monitoring, field parameter measurement, sample collection and analytical testing of groundwater at the four up-gradient and cross-gradient monitoring wells MW2-14, MW2A-16, MW3-14 and MW10-17. During the September/October event, MW2-14, MW2A-14 and MW3-14 were dry.
- Water level monitoring, field parameter measurement, sample collection and analytical testing of groundwater at the downgradient well MW11-19. Monitoring well MW11-19 was installed in April 2019. This well was sampled in May and September.
- Water level monitoring at an additional 11 monitoring wells and one piezometer, MW1-14, MW4A-15, MW4B-15, MW5A-15, MW5B-15, MW6-17, MW7-17, MW8-17, MW9-17, MW15A-18, MW15B-18, and PZ1-19.
- Surface water level monitoring at Rico Lake and McIvor Lake.
- Field parameter measurement, sample collection and analytical testing at the leak detection system access pipe S01-17.
- Water level monitoring, field parameter measurement, sample collection and analytical testing of leachate from the lined cell. In March, one composite leachate sample was collected via test pits prior to the construction of leachate sump S03-19. In October, one sample was collected from S03-19.
- Collection of three field duplicates, one trip blank and one field blank as part of the quality assurance/quality control program.
- Field sample key (FSK) preparation and environmental database updates.

In addition to the activities listed above, a full round of water levels were collected from the 16 wells, 1 piezometer, Rico Lake and McIvor Lake in May following the installation of downgradient well MW11-19.

4.3 Sampling Methodology

Sampling was conducted in accordance with the BC Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air Emission, Water, Wastewater, Soil, Sediment and Biological Samples (British Columbia, Ministry of Environment, 2013) (BC Field Sampling Manual) and GHD's standard operating procedures. The sampling methodology consisted of the following:

- Well identification and inspection.

- Water level monitoring, followed by well volume calculation.
- Well purging and stabilization monitoring. Purging was completed using dedicated Waterra™ tubing or dedicated bailer. A minimum three well volumes were purged at wells with good recovery. Wells with insufficient yield were purged dry and allowed to recover followed by sample collection. Field measurements included pH, conductivity, temperature, turbidity, and oxidation-reduction potential.
- Leachate samples were collected from the test pits using low-flow techniques and from the sump using a dedicated bailer. Field measurements included pH, conductivity, temperature, turbidity, and oxidation-reduction potential.
- Sampling equipment was decontaminated between each water quality monitoring location.
- Groundwater and leachate samples designated for dissolved metals analysis were collected, filtered, and preserved in the field.
- Leachate and surface water samples designated for total metals analysis were collected, and preserved in the field.
- Samples were collected in the appropriate laboratory-supplied sample containers, preserved as required, packaged in an ice-chilled cooler, and delivered to the laboratory under chain-of-custody protocol to meet holding time requirements.

4.4 Laboratory Program

Analytical services were provided by Bureau Veritas Laboratories (BV) of Burnaby, BC. BV is an accredited by the Canadian Association for Laboratory Accreditation (CALA) to perform the analytical tests required as part of the EMP. Laboratory reports and respective field sample keys (FSK) for each monitoring event are provided in Appendix C.

4.5 Data Quality Assessment and Validation

A qualified GHD chemist completed data validation to assess laboratory and field QA/QC measures. The QA/QC results presented in the annual memorandum (Appendix D) indicate that data exhibited acceptable levels of accuracy and precision with the qualifications noted. All data collected for the 2019 EMP has been determined to be acceptable for use in this Annual Report.

5. EMP Results and Water Quality Assessment

This section presents the EMP results and an assessment of groundwater and leak detection layer water for any evidence of landfill-derived alterations. Water quality was assessed through an evaluation of the spatial distribution and temporal trends of typical leachate indicator parameters in downgradient groundwater as compared to leachate and background quality as well as baseline results (2015 to 2018 data). Baseline results were established prior to landfilling as part of the HHCR. Concentration versus time plots for leachate indicator parameters are presented in Appendix E.

5.1 Water Level Monitoring Results

Water levels were measured from the monitoring wells on-Site in March, May and September. Water level monitoring data is presented in the attached Table 1.

Groundwater contours for March, May, and September are presented on Figures 4, 5 and 6. These figures illustrate the inferred groundwater flow direction within the sand and gravel aquifer, which is directed from the northwest towards the southeast (i.e., from McIvor Lake towards the southeast corner of the Site) during all three monitoring events. McIvor Lake is the headwaters for the sand and gravel aquifer underlying the Site.

Seasonal trends were evaluated for the Site, in general the highest groundwater levels are recorded in March (coinciding with the spring freshet) and the lowest levels are recorded in September (following periods of relatively lower precipitation). During the Reporting Period, water levels followed the same seasonal trend. In 2019, the groundwater table was on average 3.8 m higher in March than in September.

5.2 Leachate Quality

Characterization of leachate generated within the Original Lined Cell was completed via sample collection from test pits and leachate sump S03-19. Leachate samples were analyzed for general chemistry, nutrients, sulphides, metals (total and dissolved), PAHs, VOCs and EPHs. The analytical leachate results are provided in Table 2.

Based on the leachate analytical results, leachate can be characterized as:

- Weak leachate containing low concentrations of COD, BOD, TOC, ammonia, and nitrogen as well as high concentrations of calcium and magnesium due to the nature of the C&D waste.
- Containing VOC concentrations less than applicable standards (Section 6.1) likely derived from the acceptance of soil that meets the applicable soil discharge Standards for the Site (IL).
- Containing PAH concentrations greater than standards (Section 6.1) likely derived from the presence of the creosote treated wood waste within the lined cell.

5.3 Treated Leachate Effluent Quality

During the Reporting Period, leachate was not discharged from the leachate management works, as the leachate management works were under construction/commissioning.

5.4 Leachate Indicator Parameters

The leachate indicator parameters selected for the Site were based on parameters that are typically elevated in construction and demolition landfill leachate as well as contaminated soils:

- Hardness
- Total Dissolved Solids (TDS) (lab)
- Conductivity (lab)
- Chloride
- Sulphate
- Ammonia
- Boron
- Iron

- Alkalinity (total)
- Hydrogen Sulphide
- Manganese
- Oxidation Reduction Potential (ORP)

Parameter	Description
Hardness	Caused by the increased concentrations of calcium and magnesium ions due to the waste materials and more acidic pH breaking down the native lime-rich soils.
TDS	Caused by the increased amount of cations and anions in solution due to the waste materials and dissolution of salts.
Conductivity	Electrical or specific conductivity increases in leachate-affected groundwater due to the increased conductive capacity of water as a result of increased dissolved ions.
Chloride	Chloride is generally abundant in municipal solid waste, however, is often found at lower concentrations in construction and demolition waste (Townsend, 2000). Chloride is formed in part by the degradation of various wastes and can be a very useful leachate indicator parameter because it is not subject to retardation processes and is therefore a conservative tracer.
Alkalinity	Alkalinity typically increases down-gradient of landfills primarily due to elevated levels of dissolved carbon dioxide in affected water (produced by the biological breakdown of organic material) causing the dissolution of carbonate from natural geologic materials within the aquifer.
Hydrogen Sulphide	Under anaerobic conditions, sulphide (as H_2S) is observed through the reduction of sulphur species. The reducing conditions resulting from the presence of buried waste favor the development of sulphide in leachate.
Sulphate	Construction and demolition waste landfills often generate elevated concentrations of sulphate in leachate due to the abundance of sulphate available from gypsum in drywall and other building materials in the waste stream.
Ammonia	High concentrations of ammonia are observed when the landfill enters its anaerobic stage. In the anaerobic stage, anaerobic decomposition dominates, resulting in more ammonia than nitrate or nitrite.
Boron	Boron is a useful leachate indicator parameter as it is not subject to retardation processes and is therefore a conservative tracer.
Iron and Manganese	Concentrations typically increase in landfill-affected groundwater due to the alteration of redox conditions within the groundwater. The breakdown of dissolved organic matter within leachate consumes dissolved oxygen and related oxygen sources in groundwater and creates reducing conditions. Where conditions are reducing, naturally-occurring iron and manganese oxides within the geologic material are reduced to more soluble forms.

5.1 Leak Detection System Water Quality

The leak detection system was sampled via the leak detection pipe (S01-17) to assess water quality in the leak detection system and the potential for leachate leakage through the upper liner of the lined cell. It is important to note that a secondary liner is present beneath the leak detection layer.

Leak detection water samples were analyzed for general chemistry, nutrients, total or dissolved metals, polycyclic aromatic hydrocarbons (PAHs) and volatile petroleum hydrocarbons (VOCs). The 2019 analytical results are presented in the attached Table 3.

A summary of the indicator parameter concentrations reported in the water sampled from the leak detection system are shown in Table 5.1.

Table 5.1 Leachate Water Quality Summary of Key Parameters

Parameter	Up-gradient Concentration Range	Cross-Gradient Concentration Range	Downgradient Concentration Range	Leak Detection System	Leachate Range
ORP (millivolts)	210 – 267	171 – 219	161 – 184	-50 – 163	7 – 42
TDS (lab)	34 – 132	80 – 90	128 – 320	270 – 546	500-520
Dissolved Hardness	30.5 – 103	55.5 – 61.3	68.4 – 258	158 – 280	349-377
Conductivity (lab) (uS/cm)	73.1 – 246	149 – 150	175 – 530	440 – 911	790
Bicarbonate	41.8 – 125	78 – 84.3	84.3 – 340	210	496 – 496
Alkalinity	34.3 – 103	64 – 69.1	69.1 – 280	170 – 172	340-406
Chloride	5.7 – 7.7	3.6 – 5.9	2.4 – 10	17 – 85	13-16
Sulphur	<3.0 – 4.1	<3.0	<3.0	9.7 – 51.6	<3.0-22.1
Sulphate	2.2 – 13.6	4.3 – 7.3	5.7 – 8.9	29 - 168	6.6 - 74
Hydrogen Sulphide	<0.0020	<0.0020	<0.019 – 0.026	0.017 – 0.034	<0.002-0.032
Dissolved Boron	<0.050	<0.050	<0.050	<0.100	<0.05-0.057
Dissolved Iron	<0.005-0.007	<0.0050 – 0.0060	<0.005 – 0.190	0.050 – 44.6	0.170-6.790
Dissolved Manganese	<0.001	<0.001	0.0187 – 0.026	12.1 – 13.6	1.76-3.86
Total Boron	--	--	--	<0.25 – <0.10	<0.05-0.063
Total Iron	--	--	--	0.098 – 87.9	1.11-10.3
Total Manganese	--	--	--	12.3 – 12.9	1.82-3.68
Total PAHs	--	--	<0.00010	<0.00010	0.0023-1.3*

Notes: Units are in mg/L unless otherwise noted; RED - greater than CSR DW Standards; -- data not available.
Up-gradient data represents March conditions only. Up-gradient wells were dry during the Sept/Oct event.
*Select PAH analyte concentrations are great than CSR DW Standards, refer to Table 2.

General Chemistry Parameters and Nutrients

Elevated concentrations of general chemistry and nutrients were detected in the leak detection system water sample when compared to up-gradient groundwater. Elevated concentrations include TDS, dissolved hardness, conductivity, bicarbonate, alkalinity, chloride, sulphur, sulphate, and hydrogen sulfide. The majority of these concentrations exceeded 2019 leachate concentrations at least once during the Reporting Period (excluding hardness and alkalinity).

Water within the leak detection system showed variable concentrations between monitoring events in 2019. In May, several general chemistry parameters and nutrients showed higher concentration than in October. In October, reducing conditions were apparent as indicated by a negative oxidation reduction potential value and increased concentrations of dissolved metals that are sensitive to

changes in oxidation reduction potential (e.g., iron and manganese). Metals are further discussed in the section below. At this time water quality trends are not apparent.

Metals

Elevated concentrations of metals were detected in the leak detection system water. Iron and manganese show highly variable concentrations between monitoring events carried out both in 2018 and 2019.

In 2018, ORP measurements ranged from 68 mV to -47 mV between the June and September monitoring events. Reducing conditions were apparent during the September/October event as indicated by a negative ORP of -47 mV and corresponding increased concentrations of iron and manganese. Iron showed the greatest increase from 1.71 mg/L to 30.8 mg/L between the June and September monitoring events.

In 2019, ORP measurements ranged from 163 mV to -50 mV between the March and October monitoring events. Reducing conditions were also apparent during the October event as indicated by a negative ORP of -50 mV and increased concentrations of iron and manganese. Iron again showed the greatest increase from 0.05 mg/L to 44.6 mg/L between the 2019 EMP events.

In general the metal analytes that are not sensitive to changes in ORP are similar between monitoring events.

In addition, a number of metals are higher in concentration within the leak detection water than in leachate including iron, manganese, aluminum, barium and cobalt (i.e., similar pattern in general chemistry parameters and nutrients).

PAHs and Petroleum Products

PAH compounds in the leak detection layer water sample were less than the laboratory reporting levels (i.e. not detected) with the exception of anthracene in September/October. Anthracene was reported at 0.010 ug/L. Petroleum products were not detected in the leak detection layer water sample.

VOCs

VOCs were not detected in the leak detection system water sample.

5.2 Groundwater Quality

Water quality results have been assessed for evidence of leachate derived alterations. Up-gradient and cross-gradient groundwater samples were analyzed for general chemistry parameters, nutrients, and dissolved metals. Downgradient groundwater samples were analyzed for general chemistry, nutrients, total or dissolved metals, polycyclic aromatic hydrocarbons (PAHs) and volatile petroleum hydrocarbons (VOCs). The 2019 analytical results are presented in Table 4.

A summary of the indicator parameter concentrations reported in the upgradient wells (MW2-14, MW2A-16, MW3-14), and cross-gradient well (MW10-17) are shown in Table 5.1.

Up-gradient Groundwater Monitoring Wells

Water quality at the up-gradient monitoring wells (MW2-14, MW2A-16 and MW3-14) is characterized as relatively fresh water with low concentrations of alkalinity, hardness (soft to moderately hard), chloride and TDS.

The 2019 dataset was compared to historical concentrations. Little variation was observed between the 2017, 2018 and 2019 monitoring events at the up-gradient groundwater monitoring wells with the exception of MW2-14 in March 2019. This location showed higher concentrations of alkalinity, sulphate, TDS, turbidity, conductivity, hardness, bicarbonate, calcium, magnesium, and sodium when compared to historical data. At this time, no trends or water quality conclusions can be made related to the concentrations reported at MW2-14 in March 2019.

Cross-gradient Groundwater Monitoring Well

Water quality at the cross-gradient well (MW10-17) is similar in quality to the up-gradient wells and is also characterized as relatively fresh water with low concentrations of alkalinity, hardness (moderately hard), chloride, and TDS. Little variation was observed between the 2017, 2018 and 2019 monitoring events at the cross-gradient groundwater monitoring well.

Downgradient Groundwater Monitoring Well

The water quality at the downgradient well (MW11-19) showed variable analyte concentrations during the May and September monitoring events.

In May, water quality at MW11-19 is similar in quality to the up-gradient and cross-gradient wells and is also characterized as relatively fresh water with low concentrations of alkalinity, hardness (moderately hard), chloride, and TDS. In September, this location showed higher concentrations of alkalinity, TDS, turbidity, conductivity, hardness, bicarbonate, calcium, magnesium, and sodium. Given that MW11-19 is a newly installed well, the variations in water quality may be an anomaly. At this time, no trends or water quality conclusions can be made related to the variable concentrations reported in May and September. No exceedances of the CSR DW were observed.

6. Compliance Assessment

A compliance assessment of groundwater quality was completed by comparing analytical concentrations against the applicable water quality standards. The applicability of standards depend on current and future groundwater and surface water uses, and the potential for groundwater on-Site to discharge to surface water bodies that support aquatic life.

6.1 Applicable Water Quality Standards

The downgradient groundwater analytical results have been assessed to the BC CSR Generic Numerical Water Standards for DW, Schedule 3.2 as specified in Section 3.5 of the OC.

The CSR DW Standards are appropriate for evaluating water quality at permitted landfills as stated in the BC MOE Landfill Criteria for Municipal Solid Waste (Second Edition, June 2016) and based on the following rationale.

Rationale

Protocol 21 states that both current and future drinking water use must be considered when determining whether CSR DW standards apply to a site. Future land use in the vicinity of the Site may include potable water supply, therefore the drinking water exposure pathway is applicable for the Site and DW standards apply.

Protocol 21 also states that CSR freshwater aquatic life (FWAL) standards apply to sites located within 500 m of an aquatic receiving environment (i.e., a surface water body containing aquatic life) unless it can be demonstrated that the groundwater discharges into a different surface water body (located greater than 500 m from the site) or that groundwater does not migrate to within 500 m of a surface water body that contains aquatic life. The results of the aquatic life assessment completed down-gradient of the Site as part of the HHCR revealed that no surface water bodies are present within 500 m east of the Site. The assessment identified two watercourses within 500 m of the southeast Site boundary; however, the watercourses are located cross-gradient of the Original Landfill and at an elevation well above groundwater leaving the Site. In addition, Rico Lake and McIvor Lake are located up-gradient based on Site flow patterns (Figures 3, 4 and 5) and are, therefore, also not considered aquatic receiving environments. Based on these results, the CSR AW Standards do not apply to groundwater quality at the Site.

6.2 Downgradient Groundwater Quality Assessment

Water quality compliance at the Site boundary was assessed by comparing groundwater concentrations from samples collected at MW11-19 to CSR DW Standards. As presented in Table 4, groundwater concentrations were significantly less than the applicable CSR DW Standards (i.e., well below 20% of the Standard) indicating Site compliance with respect to water quality.

7. Conclusions

Based on the results of this Annual Report, the operational and water quality conclusions presented below can be made. The annual status form is provided in Appendix F.

- The Original Landfill was compliant with the operational conditions of the OC during the Reporting Period and no complaints were received.
- No construction or modification to the Original Landfill occurred with the exception of leachate sump S05-19 which was constructed to replace leachate sump S03-17.
- Original Leachate Management Works remained under construction during 2019 and is scheduled for completion in 2020.
- An estimated total of 110 m^3 of C&D waste, 2,461 m^3 of creosote timbers, and 2,874 m^3 of clean soil was discharged to the Original Lined Cell in 2019.
- The 2019 airspace consumption was estimated at 5,445 m^3.
- The total remaining airspace for the Original Landfill is estimated at 29,855 m^3.
- The remaining life for the Original Lined Cell is under one year if waste is discharged at the annual maximum allowable of 45,000 tonnes per year.

Water Quality Conclusions

- Water level monitoring results show that the highest groundwater levels are recorded in March (coinciding with the spring freshet) and the lowest levels are recorded in September (following periods of relatively lower precipitation). The groundwater table was on average 3.8 m higher in March than in September and the groundwater flow direction was in a general southeasterly direction.
- Leachate is characterized as a weak leachate. VOCs and PAHs are present in leachate likely derived from the acceptance of IL soil and creosote treated wood waste. Calcium and magnesium concentrations are elevated due to the acceptance of C&D waste.
- Several general chemistry, nutrients and metal analytes are present within the leak detection water at higher concentrations than observed in the leachate. PAH and petroleum products are not detected in the leak detection water but are detected in leachate. The ORP, iron and manganese levels measured in the leak detection water showed significant variability between monitoring events, consistent with the 2018 results.
- The variability of the leak detection water chemistry between monitoring events indicates that water quality within the leak detection layer is not representative of leachate contained within the lined cell. The inconsistency in chemistry suggests an additional source of impact is present but does not rule out leachate as a contributing source. It is reported by Upland that the drainage material (uniform medium sand) in the leak detection system was sourced from a local highway project and imported to the Site during construction of the lined cell. Reducing conditions occurring within the leak detection layer during the September/October monitoring events in both 2018 and 2019 needs to be investigated.
- Metals including cobalt, iron, and manganese are present in the leak detection water at concentrations greater than the treated leachate effluent discharge criteria, which are the CSR DW Standards.
- Groundwater quality at the up-gradient and cross-gradient monitoring wells is consistent with previous water quality monitoring results with the exception of MW2-14.
- Downgradient groundwater concentrations were significantly less than the applicable CSR DW Standards (i.e., well below 20% of the Standard). The Site is in compliance with respect to water quality.

8. Recommendations

Based on the conclusions presented in this Annual Report, the following operational and water quality recommendations can be made:

Operational Recommendations

- Continue to transfer leachate from the Original Lined Cell to the on-Site leachate storage tanks. The periodic removal of leachate will reduce the potential for leachate seepage through the upper liner of the lined cell into the leak detection system.

- Complete construction of the Original Leachate Management Works including testing and commissioning.
- Treated leachate effluent should be sampled prior to discharge to confirm that effluent concentrations are below the CSR DW Standards.
- Remove water from the leak detection system for treatment on-Site or at an off-Site licensed treatment and disposal facility. Treated leak detection effluent that meets the CSR DW Standards may be infiltrated on-Site. Effluent that does not meet the DW Standards will be accepted by Tervita Corporation (Newalta) located in Nanaimo, BC, or another provincially licensed facility.
- Monitor the inflow of water into the leak detection system and inspect the bermed perimeter of the Original Lined Cell for surface water infiltration.
- Complete a geochemical assessment of the leachate, and new leak detection water to further investigate the source of water quality alteration to the leak detection water.
- Upland should monitor the leachate and leak detection system water levels monthly.
- Maintain interim cover over the Original Lined Cell, or tarp the inactive face of the waste footprint to minimize infiltration and the resulting leachate generation.

Water Quality Monitoring Recommendations

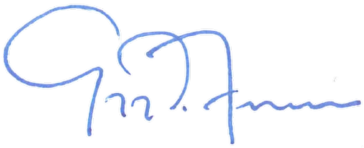
- Update the environmental monitoring program to include:
  - Sample collection from the newly installed leachate sump S05-19.
  - Water level monitoring at the leachate collection and leak detection system monitoring locations.
- Continue with sample collection at MW2-14 as outlined in the specification. If the spring 2020 groundwater quality results show elevated analyte concentrations at MW2-14, similar to that observed in May 2019, a geochemical assessment of the groundwater and potential sources of groundwater quality alteration is recommended.

All of Which is Respectfully Submitted,

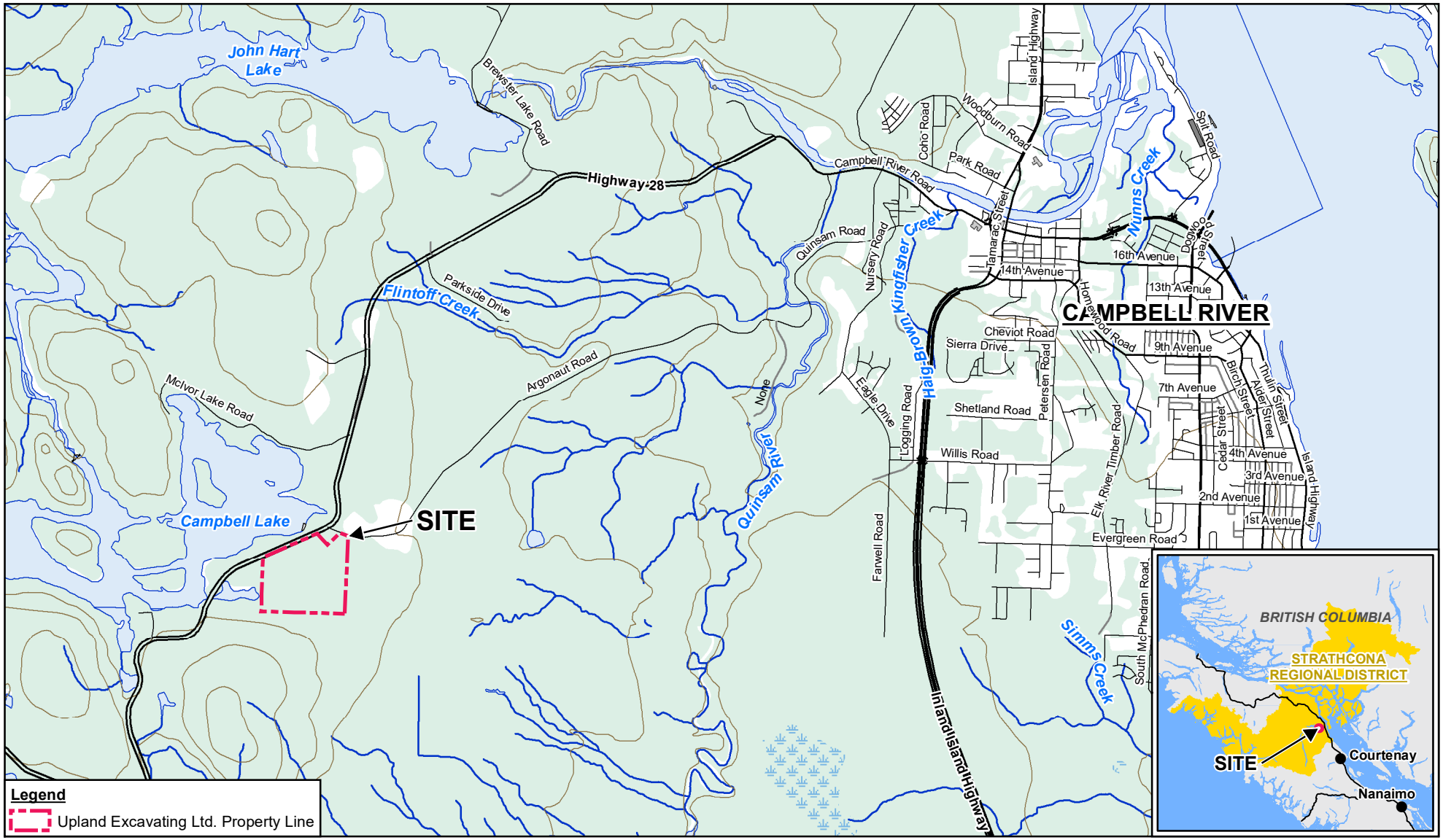
GHD

Rose Marie Rocca, P.Geo

Michelle Uyeda, P.Eng., CSAP



Greg Ferraro, P.Eng.



Source: CanVec Edition 1.1 © Department of Natural Resources Canada, all rights reserved. National Road Network 2.0 GeoBase. ESRI Base Data, 2008.

0 500 1,000 1,500
Meters

Coordinate System:
NAD 1983 UTM Zone 10N

N

GHD

UPLAND EXCAVATING PROPERTY
2019 ANNUAL OPERATIONS AND MONITORING REPORT
UPLAND ORIGINAL LANDFILL

088877-07
Mar 9, 2020

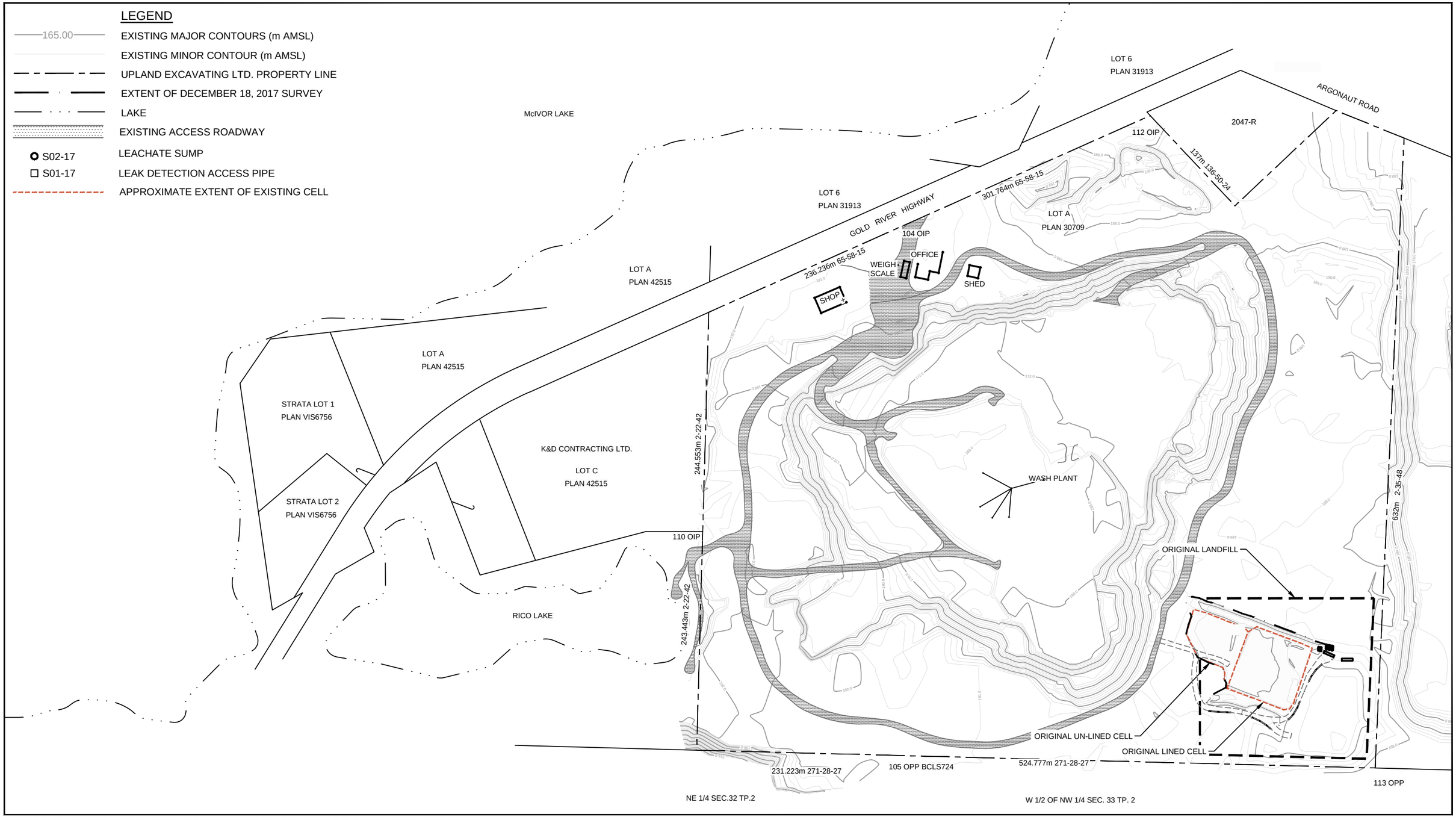
SITE LOCATION MAP

FIGURE 1

GIS File: Q:\GIS\PROJECTS\88000s\88877\Layouts\013\88877-07(013)GIS-OT001.mxd

LEGEND

- 165.00 — EXISTING MAJOR CONTOURS (m AMSL)
- EXISTING MINOR CONTOUR (m AMSL)
- UPLAND EXCAVATING LTD. PROPERTY LINE
- EXTENT OF DECEMBER 18, 2017 SURVEY
- LAKE
- EXISTING ACCESS ROADWAY
- S02-17 — LEACHATE SUMP
- S01-17 — LEAK DETECTION ACCESS PIPE
- APPROXIMATE EXTENT OF EXISTING CELL



SOURCE: TOPOGRAPHICAL SURVEY CONDUCTED BY McELHANNEY ASSOCIATES LAND SURVEYING LTD., NOVEMBER 21, 2016.

0 40 80 120m

SCALE = 1:4000

GHD

UPLAND EXCAVATING PROPERTY
2019 ANNUAL OPERATIONS AND MONITORING REPORT
UPLAND ORIGINAL LANDFILL

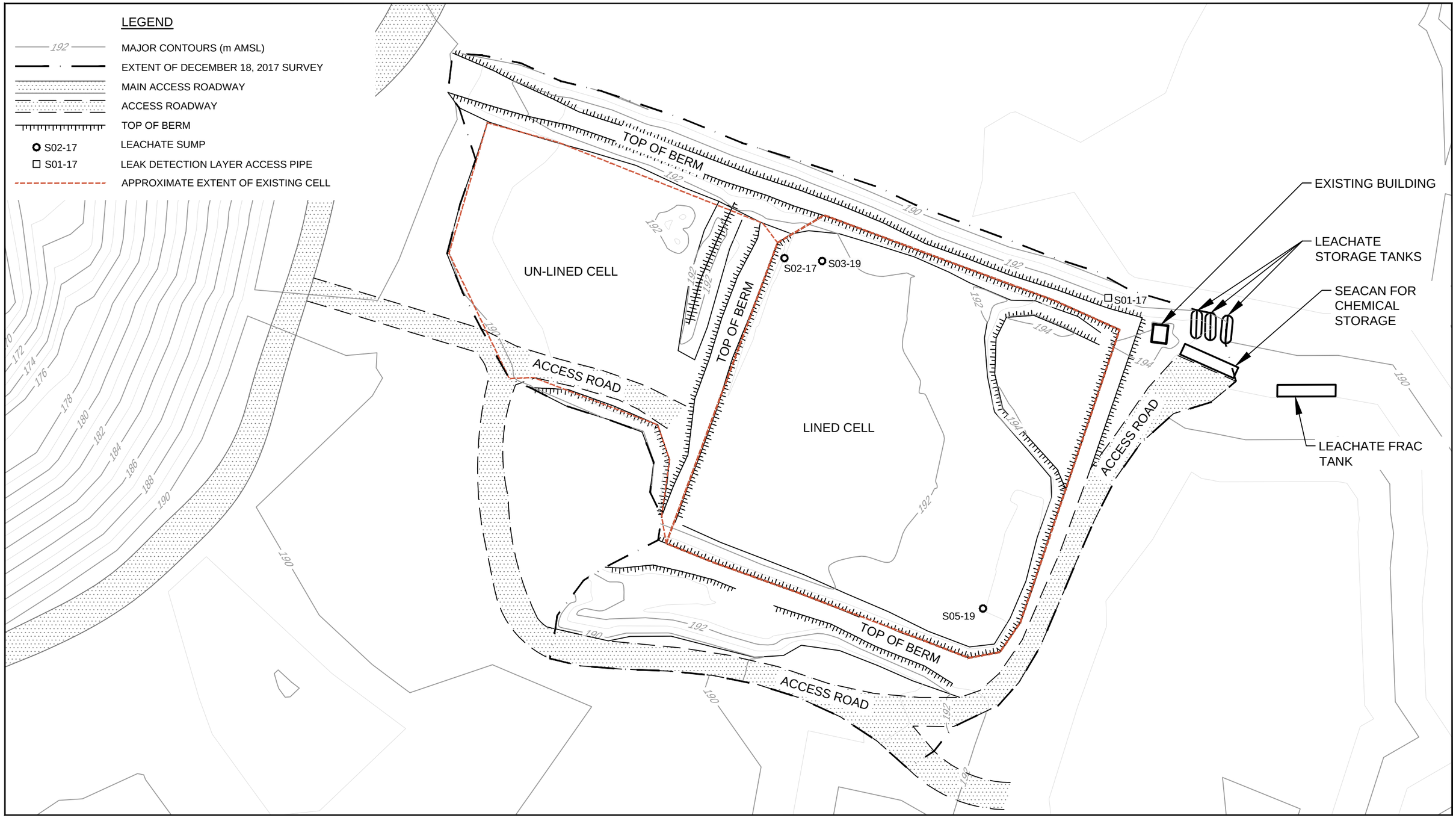
88877-07

Mar 31, 2020

SITE PLAN

FIGURE 2

CAD File: 88877-07(013)GN-WA001.DWG



SOURCE: TOPOGRAPHICAL SURVEY CONDUCTED BY McELHANNEY ASSOCIATES LAND SURVEYING LTD., NOVEMBER 21, 2016 AND DECEMBER 15, 2017.

0 6 12 18 24m

GHD

UPLAND EXCAVATING PROPERTY
2019 ANNUAL OPERATIONS AND MONITORING REPORT
UPLAND ORIGINAL LANDFILL

88877-07

Apr 1, 2020

ORIGINAL LANDFILL SITE PLAN

FIGURE 3

CAD File: 88877-07(013)GN-WA002.DWG

LEGEND

- 165.00 — EXISTING MAJOR CONTOURS (m AMSL)
- EXISTING MINOR CONTOUR (m AMSL)
- UPLAND EXCAVATING LTD. PROPERTY LINE
- EXISTING LAKE
- EXISTING ACCESS ROADWAY
- LIMIT OF EXCAVATION FOR PROPOSED LANDFILL
- LIMIT OF WASTE FOR PROPOSED LANDFILL
- MW3-14 157.1 — MONITORING WELL USED IN CONTOURING
- MW8-17* 172.9 — MONITORING WELL NOT USED IN CONTOURING
- RICO GAUGE — SURFACE WATER GAUGE
- 172.8 — GROUNDWATER ELEVATION (m AMSL)
- 170 — GROUNDWATER CONTOUR (m AMSL)
- 178 — INFERRED GROUNDWATER CONTOUR (m AMSL)
- GROUNDWATER FLOW DIRECTION
- APPROXIMATE GROUNDWATER DIVIDE

177.5 (1) (MEASURED AT LADORE DAM BY BC HYDRO LOCATED APPROX. 1.7 Km NW)

McIVOR LAKE

LOT 6 PLAN 31913

LOT A PLAN 42515

LOT A PLAN 30709

LOT C PLAN 42515

STRATA LOT 1 PLAN VIS6756

STRATA LOT 2 PLAN VIS6756

ARGONAUT ROAD

GOLD RIVER HIGHWAY

301.170m 65-58-15

236.236m 65-58-15

137m 136-50-24

244.553m 2-22-42

243.443m 2-22-42

632m 2-35-48

104 OIP

110 OIP

112 OIP

2047-R

OFFICE

SHED

SHOP

WEIGH SCALE

WASH PLANT

K&D CONTRACTING LTD.

RICO LAKE

RICO GAUGE 180.3

MW1-14 166.4

MW2-14 159.0

MW2A-16 159.1

MW3-14 157.1

MW4A-15* 164.8

MW4B-15 164.6

MW5A-15* 183.1

MW5B-15* 184.3

MW6-17 177.4

MW7-17 184.0

MW8-17 172.9

MW9-17 168.1

MW10-17 150.0

MW15A-18* 178.5

MW15B-18 178.2

ORIGINAL LANDFILL

ORIGINAL UN-LINED CELL

ORIGINAL LINED CELL

231.223m 271-28-27

105 OPP BCLS724

524.777m 271-28-27

113 OPP

NE 1/4 SEC.32 TP.2

W 1/2 OF NW 1/4 SEC. 33 TP. 2

NOTE:
1. BASED ON BC HYDRO RECORD OF WATER ELEVATIONS AT LADORE DAM RECORDED EVERY 3 HOURS. (https://www.bchydro.com/energy-in-bc/our_system/transmission_reservoir_data/previous_reservoir_elevations/vancouver_island/ladore_ldr.html)

SOURCE: TOPOGRAPHICAL SURVEY CONDUCTED BY McELHANNEY ASSOCIATES LAND SURVEYING LTD., NOVEMBER 21, 2016.

0 40 80 120m

GHD

UPLAND EXCAVATING PROPERTY
2019 ANNUAL OPERATIONS AND MONITORING REPORT
UPLAND ORIGINAL LANDFILL

GROUNDWATER ELEVATION CONTOURS SAND & GRAVEL AQUIFER - MARCH 6, 2019

88877-07

Mar 31, 2020

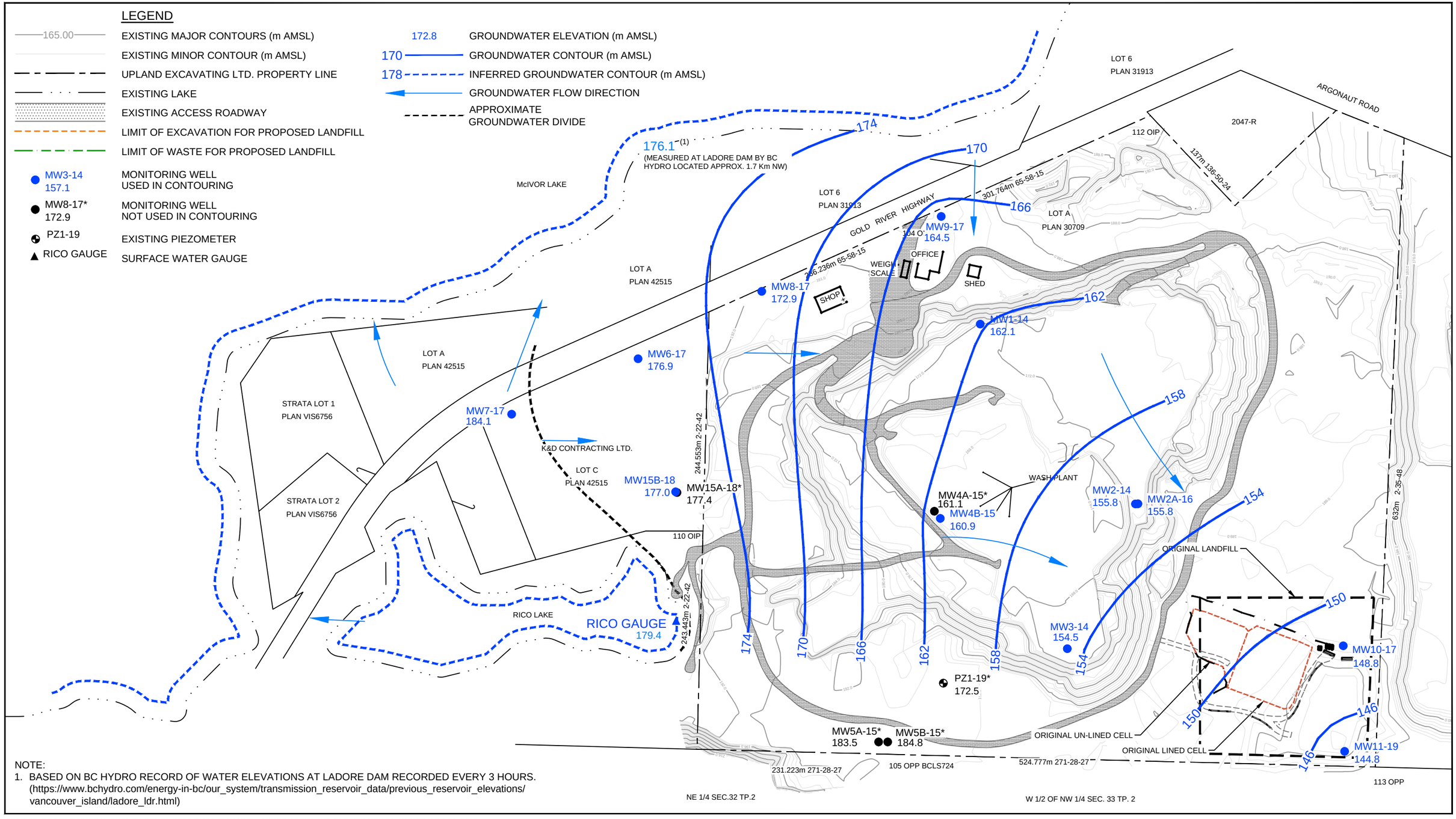
FIGURE 4

CAD File: 88877-07(013)GN-WA003.DWG

LEGEND

- 165.00 — EXISTING MAJOR CONTOURS (m AMSL)
- EXISTING MINOR CONTOUR (m AMSL)
- UPLAND EXCAVATING LTD. PROPERTY LINE
- EXISTING LAKE
- EXISTING ACCESS ROADWAY
- LIMIT OF EXCAVATION FOR PROPOSED LANDFILL
- LIMIT OF WASTE FOR PROPOSED LANDFILL
- MW3-14 157.1 — MONITORING WELL USED IN CONTOURING
- MW8-17* 172.9 — MONITORING WELL NOT USED IN CONTOURING
- PZ1-19 — EXISTING PIEZOMETER
- RICO GAUGE — SURFACE WATER GAUGE

- 172.8 — GROUNDWATER ELEVATION (m AMSL)
- 170 — GROUNDWATER CONTOUR (m AMSL)
- 178 — INFERRED GROUNDWATER CONTOUR (m AMSL)
- GROUNDWATER FLOW DIRECTION
- APPROXIMATE GROUNDWATER DIVIDE



NOTE:
1. BASED ON BC HYDRO RECORD OF WATER ELEVATIONS AT LADORE DAM RECORDED EVERY 3 HOURS. (https://www.bchydro.com/energy-in-bc/our_system/transmission_reservoir_data/previous_reservoir_elevations/vancouver_island/ladore_ldr.html)

SOURCE: TOPOGRAPHICAL SURVEY CONDUCTED BY McELHANNEY ASSOCIATES LAND SURVEYING LTD., NOVEMBER 21, 2016.

0 40 80 120m

GHD

UPLAND EXCAVATING PROPERTY
2019 ANNUAL OPERATIONS AND MONITORING REPORT
UPLAND ORIGINAL LANDFILL

GROUNDWATER ELEVATION CONTOURS SAND & GRAVEL AQUIFER - MAY 7, 2019

88877-07

Apr 1, 2020

FIGURE 5

CAD File: 88877-07(013)GN-WA004.DWG

LEGEND

- 165.00 — EXISTING MAJOR CONTOURS (m AMSL)
- EXISTING MINOR CONTOUR (m AMSL)
- UPLAND EXCAVATING LTD. PROPERTY LINE
- EXISTING LAKE
- EXISTING ACCESS ROADWAY
- LIMIT OF EXCAVATION FOR PROPOSED LANDFILL
- LIMIT OF WASTE FOR PROPOSED LANDFILL
- MW3-14 157.1 — MONITORING WELL USED IN CONTOURING
- MW8-17* 172.9 — MONITORING WELL NOT USED IN CONTOURING
- PZ1-19 — EXISTING PIEZOMETER
- RICO GAUGE — SURFACE WATER GAUGE
- 172.8 — GROUNDWATER ELEVATION (m AMSL)
- 170 — GROUNDWATER CONTOUR (m AMSL)
- 178 — INFERRED GROUNDWATER CONTOUR (m AMSL)
- GROUNDWATER FLOW DIRECTION
- APPROXIMATE GROUNDWATER DIVIDE

McIVOR LAKE

177.5 (1)
(MEASURED AT LADORE DAMBY BC HYDRO LOCATED APPROX. 1.7 Km NW)

LOT A
PLAN 42515

LOT 6
PLAN 31913

LOT 6
PLAN 31913

LOT A
PLAN 30709

ARGONAUT ROAD

2047-R

112 OIP

137m 136-50-24

301.764m 65-58-15

GOLD RIVER HIGHWAY

236.236m 65-58-15

104 O

OFFICE

WEIGH SCALE

SHED

SHOP

MW9-17
168.7

MW8-17
172.9

MW1-14*
DRY

MW6-17
176.4

MW7-17
184.0

STRATA LOT 1
PLAN VIS6756

STRATA LOT 2
PLAN VIS6756

LOT A
PLAN 42515

LOT C
PLAN 42515

K&D CONTRACTING LTD.

244.553m 2-22-42

MW15B-18*
DRY

MW15A-18*
174.7

110 OIP

243.443m 2-22-42

RICO LAKE

RICO GAUGE
180.1

WASH PLANT

MW4A-15*
159.3

MW4B-15
160.1

MW2-14*
DRY

MW2A-16*
DRY

632m 2-35-48

ORIGINAL LANDFILL

MW3-14*
DRY

PZ1-19*
172.4

MW10-17
145.2

MW5A-15*
183.6

MW5B-15*
184.0

ORIGINAL UN-LINED CELL

ORIGINAL LINED CELL

MW11-19
146.0

231.223m 271-28-27

105 OPP BCLS724

524.777m 271-28-27

113 OPP

NE 1/4 SEC.32 TP.2

W 1/2 OF NW 1/4 SEC. 33 TP. 2

NOTE:
1. BASED ON BC HYDRO RECORD OF WATER ELEVATIONS AT LADORE DAM RECORDED EVERY 3 HOURS. (https://www.bchydro.com/energy-in-bc/our_system/transmission_reservoir_data/previous_reservoir_elevations/vancouver_island/ladore_ldr.html)

SOURCE: TOPOGRAPHICAL SURVEY CONDUCTED BY McELHANNEY ASSOCIATES LAND SURVEYING LTD., NOVEMBER 21, 2016.

0 40 80 120m

GHD

UPLAND EXCAVATING PROPERTY
2019 ANNUAL OPERATIONS AND MONITORING REPORT
UPLAND ORIGINAL LANDFILL

GROUNDWATER ELEVATION CONTOURS SAND & GRAVEL AQUIFER - SEPTEMBER 30, 2019

88877-07

Mar 31, 2020

FIGURE 6

CAD File: 88877-07(013)GN-WA005.DWG

Table 1

Water Level Monitoring Data
2019 Operations and Monitoring Report
for the Original Upland Landfill
Campbell River, British Columbia

Monitoring ID	Borehole Depth (m BGS)	Reference Elevation TOR (m AMSL)	Depth to Water (m BTOR)			Water Elevation (m AMSL)			Screened Unit (Aquifer)
Date:			**6-Mar-19**	**7-May-19**	**30-Sep-19**	**6-Mar-19**	**7-May-19**	**30-Sep-19**	**Primary Constituent**
MW1-14	11.0	172.9	6.6	10.8	DRY	166.4	162.1	DRY	Sand/gravel (S&G Aquifer)
MW2-14	21.6	173.8	14.8	18.1	DRY	159.0	155.8	DRY	Sand/gravel (S&G Aquifer)
MW2A-16	45.4	173.9	14.8	18.1	DRY	159.1	155.8	DRY	Sand (S&G Aquifer)
MW3-14	18.6	168.6	11.5	14.1	DRY	157.1	154.5	DRY	Sand/gravel (S&G Aquifer)
MW4A-15	21.3	169.3	4.5	8.2	10.0	164.8	161.1	159.3	Bedrock (S&G Aquifer)
MW4B-15	18.3	169.3	4.7	8.4	9.2	164.6	160.9	160.1	Sand (S&G Aquifer)
MW5A-15	10.7	191.9	8.8	8.3	8.3	183.1	183.5	183.6	Bedrock (Shallow Aquifer)
MW5B-15	8.2	192.0	7.7	7.3	8.0	184.3	184.8	184.0	Sand/Silt with clay (Shallow Aquifer)
MW6-17	11.3	*185.4*	8.0	8.4	8.9	177.4	176.9	176.4	Sand (S&G Aquifer)
MW7-17	4.3	*187.5*	3.5	3.4	3.5	184.0	184.1	184.0	Gravel (Shallow Aquifer)
MW8-17	18.8	*192.5*	19.6	19.6	19.6	172.9	172.9	172.9	Gravel (S&G Aquifer)
MW9-17	33.5	*191.7*	23.5	27.2	23.0	168.1	164.5	168.7	Sand/gravel (S&G Aquifer)
MW10-17	46.3	*189.1*	39.0	40.3	43.9	150.0	148.8	145.2	Sand (S&G Aquifer)
MW15A-18	15.2	183.1	4.6	5.7	8.3	178.5	177.4	174.7	Bedrock (S&G Aquifer)
MW15B-18	9.0	183.2	5.0	6.2	DRY	178.2	177.0	DRY	Silty/Clayey Sand (S&G Aquifer)
MW11-19	54.9	194.8	-	50.0	48.8	-	144.8	146.0	Sand (S&G Aquifer)
PZ1-19	20.4	192.1	-	19.7	19.8	-	172.5	172.4	Sand/Silty Gravel (Shallow Aquifer)
McIvor Lake**	-	-	-	-	-	177.5	176.1	177.5	-
SW15-02 Rico Lake*	-	180.3	0.0	0.9	0.2	180.3	179.4	180.1	-

Notes:
191.88 - Surveys completed by McElhanney on April 6, 2016 and March 16 and 31, 2017.
185.4 - Survey completed by Upland Excavating Ltd. on January 29th, 2015, March 8, 2016 and April 6th, 2016. Elevations measured with respect to AMSL.
** McIvor Lake elevations are based on BC Hydro record of water elevations at Ladore Dam recorded every three hours.
* Surface water gauge reference elevation refers to the bottom of the gauge. (0 m on gauge = 180.33 m amsl) .
m BGS - metres below ground surface
m AMSL - metres above mean sea level (WGS1984)
TOR - top of riser
MW15A/B-18 were installed in July 2018.
MW11-19 & PZ1-19 were installed in April 2019.

Table 2

Leachate Analytical Results
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for the Original Upland Landfill
Campbell River, British Columbia

Sample Location:			Composite	S03-19	S03-19
Sample ID:			WL-88877-070319-RMR-07	WL-088877-021019-RP-14	WL-088877-021019-RP-15
Sample Date:		BC CSR[1] DW	3/7/2019	10/2/2019	10/2/2019 Duplicate
Parameters	**Units**				
Conductivity, field	uS/cm	--	618	377	377
Oxidation reduction potential (ORP), field	millivolts	--	7	42	42
pH, field	s.u.	--	7.06	7.12	7.12
Temperature, field	Deg C	--	5.80	12.02	12.02
Total dissolved solids, field (TDS)	g/L	--	0.396	0.245	0.245
Turbidity, field	NTU	--	78.2	12.6	12.6
General Chemistry					
Alkalinity (as CaCO3 pH=8.3)	mg/L	--	ND (1.0)	ND (1.0)	ND (1.0)
Alkalinity, total (as CaCO3)	mg/L	--	406	340	340
Biochemical oxygen demand (BOD)	mg/L	--	41.0	ND (2.0)	ND (2.0)
Chemical oxygen demand (COD)	mg/L	--	144	43	46
Chloride (dissolved)	mg/L	250	16	13	13
Conductivity	uS/cm	--	790	790	790
Hardness	mg/L	--	323	378	384
Hardness (dissolved)	mg/L	--	349	377	371
Hydrogen sulfide	mg/L	0.05	0.032 J	ND (0.0020)	ND (0.0020)
Hydroxide (as CaCO3)	mg/L	--	ND (1.0)	ND (1.0)	ND (1.0)
Orthophosphate	ug/L	--	-	ND (3)	63
pH	s.u.	--	7.77 J	8.13 J	8.13 J
Sulfide	mg/L	0.05 *ref only	0.030 J	ND (0.0018)	ND (0.0018)
Sulphate (Dissolved)	mg/L	500	6.6	69	74
Total dissolved solids (TDS)	mg/L	--	504	500	520
Total suspended solids (TSS)	mg/L	--	55.2	8.5	11
Nutrients					
Ammonia-N	mg/L	--	0.57	0.32	0.34
Bicarbonate (as CaCO3)	mg/L	--	496	420	420
Carbonate (as CaCO3)	mg/L	--	ND (1.0)	ND (1.0)	ND (1.0)
Nitrate (as N)	mg/L	10	ND (0.10)	1.04	1.04
Nitrite (as N)	mg/L	1	ND (0.10)	ND (0.10)	ND (0.10)
Nitrite/Nitrate	mg/L	10	ND (0.10)	1.04	1.04
Dissolved Metals					
Aluminum (dissolved)	ug/L	9500	17.4	10.2	14.6
Antimony (dissolved)	ug/L	6	ND (0.50)	ND (0.50)	ND (0.50)
Arsenic (dissolved)	ug/L	10	1.82	0.45	0.46
Barium (dissolved)	ug/L	1000	16.1	15.1	15.2
Beryllium (dissolved)	ug/L	8	ND (0.10)	ND (0.10)	ND (0.10)
Bismuth (dissolved)	ug/L	--	ND (1.0)	ND (1.0)	ND (1.0)
Boron (dissolved)	ug/L	5000	57	ND (50)	ND (50)
Cadmium (dissolved)	ug/L	5	0.015	0.147	0.150
Calcium (dissolved)	ug/L	--	113000	119000	116000
Chromium (dissolved)	ug/L	50	1.2	ND (1.0)	ND (1.0)
Cobalt (dissolved)	ug/L	20 (i)	2.35	0.63	0.63
Copper (dissolved)	ug/L	1500	0.86	14.9	13.6
Iron (dissolved)	ug/L	6500	**6970**	175	170
Lead (dissolved)	ug/L	10	ND (0.20)	ND (0.20)	ND (0.20)
Lithium (dissolved)	ug/L	8	ND (2.0)	ND (2.0)	ND (2.0)
Magnesium (dissolved)	ug/L	--	16100	19400	19500
Manganese (dissolved)	ug/L	1500	**3860**	**1760**	**1760**
Mercury (dissolved)	ug/L	1	ND (0.0020)	ND (0.0020)	ND (0.050)
Molybdenum (dissolved)	ug/L	250	ND (1.0)	1.1	1.1
Nickel (dissolved)	ug/L	80	1.2	ND (1.0)	ND (1.0)
Potassium (dissolved)	ug/L	--	2480	2260	2220
Selenium (dissolved)	ug/L	10	0.22	0.34	0.33
Silicon (dissolved)	ug/L	--	9410	7870	7800
Silver (dissolved)	ug/L	20	ND (0.020)	ND (0.020)	ND (0.020)
Sodium (dissolved)	ug/L	200000	27200	19300	19500
Strontium (dissolved)	ug/L	2500	313	320	314
Sulphur (Dissolved)	ug/L	--	ND (3000)	22100	22100 / 22100
Thallium (dissolved)	ug/L	--	ND (0.010)	0.017	0.016
Tin (dissolved)	ug/L	2500	ND (5.0)	ND (5.0)	ND (5.0)
Titanium (dissolved)	ug/L	--	ND (5.0)	ND (5.0)	ND (5.0)
Uranium (dissolved)	ug/L	20	0.30	1.22	1.22
Vanadium (dissolved)	ug/L	20	ND (5.0)	ND (5.0)	ND (5.0)
Zinc (dissolved)	ug/L	3000	10.7	5.5	ND (5.0)
Zirconium (dissolved)	ug/L	--	0.55	0.17	0.18
Total Metals					
Aluminum	ug/L	9500	1650	54.0	59.3
Antimony	ug/L	6	ND (0.50)	ND (0.50)	ND (0.50)
Arsenic	ug/L	10	3.01	0.57	0.59
Barium	ug/L	1000	21.8	16.1	16.3
Beryllium	ug/L	8	ND (0.10)	ND (0.10)	ND (0.10)
Bismuth	ug/L	--	ND (1.0)	ND (1.0)	ND (1.0)
Boron	ug/L	5000	63	ND (50)	ND (50)
Cadmium	ug/L	5	0.095	0.163	0.170
Calcium	ug/L	--	103000	119000	121000
Chromium	ug/L	50	3.0	ND (1.0)	ND (1.0)
Cobalt	ug/L	20 (i)	3.24	0.71	0.70
Copper	ug/L	1500	14.4	16.4	16.5
Iron	ug/L	6500	**10300**	1110	1110
Lead	ug/L	10	0.46	ND (0.20)	ND (0.20)
Lithium	ug/L	8	ND (2.0)	ND (2.0)	ND (2.0)
Magnesium	ug/L	--	15800	19800	20100
Manganese	ug/L	1500	**3680**	**1820**	**1840**
Mercury	ug/L	1	ND (0.0020)	0.0026	ND (0.0020)
Molybdenum	ug/L	250	ND (1.0)	1.1	1.1
Nickel	ug/L	80	2.6	ND (1.0)	ND (1.0)
Potassium	ug/L	--	2460	2260	2290
Selenium	ug/L	10	0.22	0.36	0.34

Table 2

Leachate Analytical Results
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Campbell River, British Columbia

Sample Location:			Composite	S03-19	S03-19
Sample ID:			WL-88877-070319-RMR-07	WL-088877-021019-RP-14	WL-088877-021019-RP-15
Sample Date:		BC CSR[1] DW	3/7/2019	10/2/2019	10/2/2019 Duplicate
Parameters	**Units**				
Silicon	ug/L	--	11000	7490	7580
Silver	ug/L	20	ND (0.020)	ND (0.020)	ND (0.020)
Sodium	ug/L	200000	25100	19700	20000
Strontium	ug/L	2500	324	324	327
Sulphur	ug/L	--	ND (3000)	21800	22100
Thallium	ug/L	--	ND (0.010)	0.016	0.014
Tin	ug/L	2500	ND (5.0)	ND (5.0)	ND (5.0)
Titanium	ug/L	--	109	ND (5.0)	ND (5.0)
Uranium	ug/L	20	0.31	1.19	1.20
Vanadium	ug/L	20	9.2	ND (5.0)	ND (5.0)
Zinc	ug/L	3000	62.2	ND (5.0)	ND (5.0)
Zirconium	ug/L	--	0.89	0.15	0.16
Petroleum Products					
Total Petroleum Hydrocarbons VPH (C6-C10)Les	ug/L	--	ND (300)	ND (300)	ND (300)
Total Petroleum Hydrocarbons VH (C6-C10)	ug/L	15000	ND (300)	ND (300)	ND (300)
Volatile Organic Compounds					
Benzene	ug/L	5	1.1	ND (0.40)	ND (0.40)
Ethylbenzene	ug/L	140	2.3	ND (0.40)	ND (0.40)
m&p-Xylenes	ug/L	--	2.5	ND (0.40)	ND (0.40)
Methyl tert butyl ether (MTBE)	ug/L	95	ND (4.0)	ND (4.0)	ND (4.0)
o-Xylene	ug/L	--	2.0	ND (0.40)	ND (0.40)
Styrene	ug/L	800	ND (0.40)	ND (0.40)	ND (0.40)
Toluene	ug/L	60	21	ND (0.40)	ND (0.40)
Xylenes (total)	ug/L	90	4.6	ND (0.40)	ND (0.40)
PAHs					
1-Methylnaphthalene	ug/L	5.5	**74**	0.18	0.18
2-Methylnaphthalene	ug/L	15	**100**	0.13	0.13
Acenaphthene	ug/L	250	70	0.38	0.38
Acenaphthylene	ug/L	--	1.3	ND (0.050)	ND (0.050)
Acridine	ug/L	--	4.7	0.071	0.058
Anthracene	ug/L	1000	6.1	0.083	0.077
Benzo(a)anthracene	ug/L	0.07	**2.1**	0.011	0.012
Benzo(a)pyrene	ug/L	0.01	**1.2**	0.0064	0.0088
Benzo(b)fluoranthene/Benzo(j)fluoranthene	ug/L	0.07	**1.6**	ND (0.030)	ND (0.030)
Benzo(b)pyridine (Quinoline)	ug/L	0.05	**1.2**	ND (0.020)	ND (0.020)
Benzo(g,h,i)perylene	ug/L	--	0.36	ND (0.050)	ND (0.050)
Benzo(k)fluoranthene	ug/L	--	0.63	ND (0.050)	ND (0.050)
Chrysene	ug/L	7	2.7	0.027	0.028
Dibenz(a,h)anthracene	ug/L	0.01	**0.11**	ND (0.0030)	ND (0.0030)
Fluoranthene	ug/L	150	11	0.13	0.14
Fluorene	ug/L	150	28	0.15	0.16
Indeno(1,2,3-cd)pyrene	ug/L	--	0.32	ND (0.050)	ND (0.050)
Naphthalene	ug/L	80	**900**	0.93	0.90
PAH high molecular weight	ug/L	--	28	0.30	0.32
PAH low molecular weight	ug/L	--	1200	2.1	2.0
Phenanthrene	ug/L	--	40	0.15	0.15
Pyrene	ug/L	100	8.8	0.12	0.13
Total PAH	ug/L	--	1300	2.4	2.3

Table 3

Leak Detection System Analytical Results
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Campbell River, British Columbia

Sample Location:			S01-17	S01-17
Sample ID:			W-88877-060319-RMR-01	WL-088877-021019-RP-13
Sample Date:		BC CSR[(1)] DW	3/6/2019	10/2/2019
Parameters	**Units**			
Conductivity, field	uS/cm	--	727	419
Oxidation reduction potential (ORP), field	millivolts	--	163	-50
pH, field	s.u.	--	6.65	6.73
Temperature, field	Deg C	--	11.23	12.75
Total dissolved solids, field (TDS)	g/L	--	0.474	0.299
Turbidity, field	NTU	--	3.1	85.2
General Chemistry				
Alkalinity (as CaCO3 pH=8.3)	mg/L	--	ND (1.0)	ND (1.0)
Alkalinity, total (as CaCO3)	mg/L	--	172	170
Biochemical oxygen demand (BOD)	mg/L	--	ND (6.0)	4.2
Chemical oxygen demand (COD)	mg/L	--	45	105
Chloride (dissolved)	mg/L	250	85	17
Conductivity	uS/cm	--	911	440
Hardness	mg/L	--	281	166
Hardness (dissolved)	mg/L	--	280	158
Hydrogen sulfide	mg/L	0.05	0.017 J	0.034
Hydroxide (as CaCO3)	mg/L	--	ND (1.0)	ND (1.0)
Orthophosphate	ug/L	--	ND (5)	3.1
pH	s.u.	--	7.62 J	7.38 J
Sulfide	mg/L	0.05 *ref only	0.016 J	0.032
Sulphate (Dissolved)	mg/L	500	168	29
Total dissolved solids (TDS)	mg/L	--	546	270
Total suspended solids (TSS)	mg/L	--	1.2	170
Nutrients				
Ammonia-N	mg/L	--	0.30	1.2
Bicarbonate (as CaCO3)	mg/L	--	210	210
Carbonate (as CaCO3)	mg/L	--	ND (1.0)	ND (1.0)
Nitrate (as N)	mg/L	10	ND (0.10)	0.11
Nitrite (as N)	mg/L	1	ND (0.10)	ND (0.10)
Nitrite/Nitrate	mg/L	10	ND (0.10)	0.11
Dissolved Metals				
Aluminum (dissolved)	ug/L	9500	8.4	47.5
Antimony (dissolved)	ug/L	6	ND (1.0)	ND (1.0)
Arsenic (dissolved)	ug/L	10	0.45	0.77
Barium (dissolved)	ug/L	1000	32.5	25.6
Beryllium (dissolved)	ug/L	8	ND (0.20)	ND (0.20)
Bismuth (dissolved)	ug/L	--	ND (2.0)	ND (2.0)
Boron (dissolved)	ug/L	5000	ND (100)	ND (100)
Cadmium (dissolved)	ug/L	5	0.182	ND (0.020)
Calcium (dissolved)	ug/L	--	74000	42400
Chromium (dissolved)	ug/L	50	3.8	ND (2.0)
Cobalt (dissolved)	ug/L	20 (i)	**21.7**	10.7
Copper (dissolved)	ug/L	1500	2.26	1.84
Iron (dissolved)	ug/L	6500	50	**44600**
Lead (dissolved)	ug/L	10	ND (0.40)	ND (0.40)
Lithium (dissolved)	ug/L	8	ND (4.0)	ND (4.0)
Magnesium (dissolved)	ug/L	--	23200	12500
Manganese (dissolved)	ug/L	1500	**13600**	**12100**
Mercury (dissolved)	ug/L	1	ND (0.0020)	ND (0.0020)
Molybdenum (dissolved)	ug/L	250	ND (2.0)	ND (2.0)
Nickel (dissolved)	ug/L	80	10.5	ND (2.0)
Potassium (dissolved)	ug/L	--	3870	2630
Selenium (dissolved)	ug/L	10	ND (0.20)	0.21
Silicon (dissolved)	ug/L	--	4650	5130
Silver (dissolved)	ug/L	20	ND (0.040)	ND (0.040)
Sodium (dissolved)	ug/L	200000	54100	18600
Strontium (dissolved)	ug/L	2500	268	133
Sulphur (Dissolved)	ug/L	--	51600	9700
Thallium (dissolved)	ug/L	--	ND (0.020)	ND (0.020)
Tin (dissolved)	ug/L	2500	ND (10)	ND (10)
Titanium (dissolved)	ug/L	--	ND (10)	ND (10)
Uranium (dissolved)	ug/L	20	ND (0.20)	ND (0.20)
Vanadium (dissolved)	ug/L	20	ND (10)	ND (10)
Zinc (dissolved)	ug/L	3000	13	ND (10)
Zirconium (dissolved)	ug/L	--	ND (0.20)	0.33
Total Metals				
Aluminum	ug/L	9500	ND (15)	1010
Antimony	ug/L	6	ND (2.5)	ND (1.0)
Arsenic	ug/L	10	ND (0.50)	3.70
Barium	ug/L	1000	34.1	39.6
Beryllium	ug/L	8	ND (0.50)	0.23
Bismuth	ug/L	--	ND (5.0)	ND (2.0)
Boron	ug/L	5000	ND (250)	ND (100)
Cadmium	ug/L	5	0.150	0.342
Calcium	ug/L	--	74000	45200
Chromium	ug/L	50	9.6	2.9
Cobalt	ug/L	20 (i)	**22.0**	12.9
Copper	ug/L	1500	ND (2.5)	6.2
Iron	ug/L	6500	98	**87900**
Lead	ug/L	10	ND (1.0)	2.09
Lithium	ug/L	8	**ND (10)**	ND (4.0)
Magnesium	ug/L	--	23300	13000
Manganese	ug/L	1500	**12900**	**12300**
Mercury	ug/L	1	ND (0.0020)	0.0052
Molybdenum	ug/L	250	ND (5.0)	ND (2.0)
Nickel	ug/L	80	11.4	2.0
Potassium	ug/L	--	4230	2710
Selenium	ug/L	10	ND (0.50)	0.66
Silicon	ug/L	--	4430	6160
Silver	ug/L	20	ND (0.10)	ND (0.040)
Sodium	ug/L	200000	50900	19400
Strontium	ug/L	2500	258	146
Sulphur	ug/L	--	49000	10800
Thallium	ug/L	--	ND (0.050)	0.030
Tin	ug/L	2500	ND (25)	ND (10)

Table 3

Leak Detection System Analytical Results
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Campbell River, British Columbia

Sample Location:			S01-17	S01-17
Sample ID:			W-88877-060319-RMR-01	WL-088877-021019-RP-13
Sample Date:		BC CSR[(1)] DW	3/6/2019	10/2/2019
Parameters	**Units**			
Titanium	ug/L	--	ND (25)	72
Uranium	ug/L	20	ND (0.50)	0.30
Vanadium	ug/L	20	**ND (25)**	20
Zinc	ug/L	3000	ND (25)	16
Zirconium	ug/L	--	ND (0.50)	1.01
Petroleum Products				
Total Petroleum Hydrocarbons VPH (C6-C10)Les	ug/L	--	ND (300)	ND (300)
Total Petroleum Hydrocarbons VH (C6-C10)	ug/L	15000	ND (300)	ND (300)
Volatile Organic Compounds				
Benzene	ug/L	5	ND (0.40)	ND (0.40)
Ethylbenzene	ug/L	140	ND (0.40)	ND (0.40)
m&p-Xylenes	ug/L	--	ND (0.40)	ND (0.40)
Methyl tert butyl ether (MTBE)	ug/L	95	ND (4.0)	ND (4.0)
o-Xylene	ug/L	--	ND (0.40)	ND (0.40)
Styrene	ug/L	800	ND (0.40)	ND (0.40)
Toluene	ug/L	60	ND (0.40)	ND (0.40)
Xylenes (total)	ug/L	90	ND (0.40)	ND (0.40)
PAHs				
1-Methylnaphthalene	ug/L	5.5	ND (0.050)	ND (0.050)
2-Methylnaphthalene	ug/L	15	ND (0.10)	ND (0.10)
Acenaphthene	ug/L	250	ND (0.050)	ND (0.050)
Acenaphthylene	ug/L	--	ND (0.050)	ND (0.050)
Acridine	ug/L	--	ND (0.050)	ND (0.050)
Anthracene	ug/L	1000	ND (0.010)	0.010
Benzo(a)anthracene	ug/L	0.07	ND (0.010)	ND (0.010)
Benzo(a)pyrene	ug/L	0.01	ND (0.0050)	ND (0.0050)
Benzo(b)fluoranthene/Benzo(j)fluoranthene	ug/L	0.07	ND (0.030)	ND (0.030)
Benzo(b)pyridine (Quinoline)	ug/L	0.05	ND (0.020)	ND (0.020)
Benzo(g,h,i)perylene	ug/L	--	ND (0.050)	ND (0.050)
Benzo(k)fluoranthene	ug/L	--	ND (0.050)	ND (0.050)
Chrysene	ug/L	7	ND (0.020)	ND (0.020)
Dibenz(a,h)anthracene	ug/L	0.01	ND (0.0030)	ND (0.0030)
Fluoranthene	ug/L	150	ND (0.020)	ND (0.020)
Fluorene	ug/L	150	ND (0.050)	ND (0.050)
Indeno(1,2,3-cd)pyrene	ug/L	--	ND (0.050)	ND (0.050)
Naphthalene	ug/L	80	ND (0.10)	ND (0.10)
PAH high molecular weight	ug/L	--	ND (0.050)	ND (0.050)
PAH low molecular weight	ug/L	--	ND (0.10)	ND (0.10)
Phenanthrene	ug/L	--	ND (0.050)	ND (0.050)
Pyrene	ug/L	100	ND (0.020)	ND (0.020)
Total PAH	ug/L	--	ND (0.10)	ND (0.10)

Table 4

Groundwater Analytical Results
2019 Operations and Monitoring Report
for the Original Upland Landfill
Campbell River, British Columbia

Well Location:			Upgradient	Upgradient	Upgradient	Upgradient	Cross-Gradient	Cross-Gradient
Sample Location:			MW2-14	MW2A-16	MW2A-16	MW3-14	MW10-17	MW10-17
Sample ID:			WG-88877-070319-RMR-05	WG-88877-070319-RMR-03	WG-88877-070319-RMR-04	WG-88877-070319-RMR-06	WG-88877-070319-RMR-02	WG-088877-300919-RP-02
Sample Date:		BC CSR[1]	3/7/2019	3/7/2019	3/7/2019	3/7/2019	3/7/2019	9/30/2019
		DW			Duplicate			
Parameters	**Units**							
Field Parameters								
Conductivity, field	uS/cm	--	220	66	66	114	138	133
Oxidation reduction potential (ORP), field	millivolts	--	250	210	210	267	219	171
pH, field	s.u.	--	7.59	8.48	8.48	7.39	8.09	8.11
Temperature, field	Deg C	--	11.33	11.14	11.14	7.66	10.15	11.52
Total dissolved solids, field (TDS)	g/L	--	0.143	0.042	0.042	0.074	0.09	0.087
Turbidity, field	NTU	--	24	0.2	0.2	57.4	0	16
General Chemistry								
Alkalinity (as CaCO3 pH=8.3)	mg/L	--	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Alkalinity, total (as CaCO3)	mg/L	--	103	34.3	34.3	43.9	69.1	64
Chemical oxygen demand (COD)	mg/L	--	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	-
Chloride (dissolved)	mg/L	250	5.7	ND (1.0)	ND (1.0)	7.7	3.6	5.9
Conductivity, lab	uS/cm	--	246	73.2	73.1	126	149	150
Hardness (dissolved)	mg/L	--	103	30.6	30.5	40.3	55.5	61.3
Hydrogen sulfide	mg/L	0.05	ND (0.0020)	ND (0.0020)	ND (0.0020)	ND (0.0020)	ND (0.0020)	ND (0.0020)
Hydroxide (as CaCO3)	mg/L	--	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Orthophosphate	mg/L	--	0.0072	0.0225	0.0221	0.0056	0.0113	0.014
pH	s.u.	--	7.92 J	7.53 J	7.49 J	7.56 J	7.85 J	7.08 J
Sulfate (dissolved)	mg/L	500	13.6	2.3	2.2	6.2	4.3	7.3
Sulfide	mg/L	0.05 *ref only	ND (0.0019)	ND (0.0019)	ND (0.0019)	ND (0.0019)	ND (0.0019)	ND (0.0018)
Total dissolved solids (TDS)	mg/L	--	132	34	36	38	80	90
Total suspended solids (TSS)	mg/L	--	-	-	-	-	-	-
Nutrients								
Ammonia-N	mg/L	--	ND (0.015)	ND (0.015)	ND (0.015)	ND (0.015)	ND (0.015)	0.023
Bicarbonate (as CaCO3)	mg/L	--	125	41.8	41.9	53.5	84.3	78
Carbonate (as CaCO3)	mg/L	--	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Nitrate (as N)	mg/L	10	0.61	ND (0.10)	ND (0.10)	0.58	0.14	0.38
Nitrite (as N)	mg/L	1	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)
Nitrite/Nitrate	mg/L	10	0.61	ND (0.10)	ND (0.10)	0.58	0.14	0.38
Dissolved Metals								
Aluminum (dissolved)	ug/L	9500	3.4	7.2	7	ND (3.0)	ND (3.0)	6.9
Antimony (dissolved)	ug/L	6	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)
Arsenic (dissolved)	ug/L	10	0.12	0.85	0.85	ND (0.10)	0.47	0.4
Barium (dissolved)	ug/L	1000	2.5	3.6	2.9	1.3	7.5	3.8
Beryllium (dissolved)	ug/L	8	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)
Bismuth (dissolved)	ug/L	--	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Boron (dissolved)	ug/L	5000	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)
Cadmium (dissolved)	ug/L	5	ND (0.010)	ND (0.010)	ND (0.010)	ND (0.010)	ND (0.010)	ND (0.010)
Calcium (dissolved)	ug/L	--	32600	9970	9970	12000	17900	19500
Chromium (dissolved)	ug/L	50	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	1.4	1.6
Cobalt (dissolved)	ug/L	20 (i)	ND (0.20)	ND (0.20)	ND (0.20)	ND (0.20)	ND (0.20)	ND (0.20)
Copper (dissolved)	ug/L	1500	0.33	0.38	ND (0.20)	0.35	1.23	ND (0.20)
Iron (dissolved)	ug/L	6500		7	ND (5.0)	ND (5.0)	6	ND (5.0)
Lead (dissolved)	ug/L	10	ND (0.20)	ND (0.20)	ND (0.20)	ND (0.20)	ND (0.20)	ND (0.20)
Lithium (dissolved)	ug/L	8	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)
Magnesium (dissolved)	ug/L	--	5220	1380	1370	2540	2600	3030
Manganese (dissolved)	ug/L	1500	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Mercury (dissolved)	ug/L	1	ND (0.0020)	ND (0.0020)	ND (0.0020)	ND (0.0020)	ND (0.0020)	ND (0.0020)
Molybdenum (dissolved)	ug/L	250	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Nickel (dissolved)	ug/L	80	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Potassium (dissolved)	ug/L	--	301	168	160	177	341	344
Selenium (dissolved)	ug/L	10	0.2	0.1	ND (0.10)	0.21	0.1	0.24
Silicon (dissolved)	ug/L	--	6180	3740	3690	4320	5840	5230
Silver (dissolved)	ug/L	20	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)
Sodium (dissolved)	ug/L	200000	5440	940	921	7780	6280	6640
Strontium (dissolved)	ug/L	2500	54.1	14.1	13.6	24.4	27.1	28
Sulfur (dissolved)	ug/L	--	4100	ND (3000)	ND (3000)	ND (3000)	ND (3000)	ND (3000)
Thallium (dissolved)	ug/L	--	ND (0.010)	ND (0.010)	ND (0.010)	ND (0.010)	ND (0.010)	ND (0.010)
Tin (dissolved)	ug/L	2500	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)
Titanium (dissolved)	ug/L	--	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)
Uranium (dissolved)	ug/L	20	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)
Vanadium (dissolved)	ug/L	20	ND (5.0)	6.3	6.2	ND (5.0)	ND (5.0)	ND (5.0)
Zinc (dissolved)	ug/L	3000	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)
Zirconium (dissolved)	ug/L	--	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)
Petroleum Products								
VHw6-10	ug/L	15000	-	-	-	-	-	-
VPHw	ug/L	--	-	-	-	-	-	-
Volatile Organic Compounds								
1,1,1,2-Tetrachloroethane	ug/L	6	-	-	-	-	-	-
1,1,1-Trichloroethane	ug/L	8000	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	ug/L	0.8	-	-	-	-	-	-
1,1,2-Trichloroethane	ug/L	3	-	-	-	-	-	-
1,1-Dichloroethane	ug/L	30	-	-	-	-	-	-
1,1-Dichloroethene	ug/L	14	-	-	-	-	-	-
1,2,3-Trichlorobenzene	ug/L	3	-	-	-	-	-	-
1,2,4-Trichlorobenzene	ug/L	5.5	-	-	-	-	-	-
1,2-Dibromoethane (Ethylene dibromide)	ug/L	0.5	-	-	-	-	-	-
1,2-Dichlorobenzene	ug/L	200	-	-	-	-	-	-
1,2-Dichloroethane	ug/L	5	-	-	-	-	-	-
1,2-Dichloropropane	ug/L	4.5	-	-	-	-	-	-
1,3,5-Trimethylbenzene	ug/L	40	-	-	-	-	-	-
1,3-Butadiene	ug/L	1	-	-	-	-	-	-
1,3-Dichlorobenzene	ug/L	--	-	-	-	-	-	-
1,3-Dichloropropane	ug/L	80	-	-	-	-	-	-
1,4-Dichlorobenzene	ug/L	5	-	-	-	-	-	-
Benzene	ug/L	5	-	-	-	-	-	-
Bromobenzene	ug/L	30	-	-	-	-	-	-
Bromodichloromethane	ug/L	100	-	-	-	-	-	-
Bromoform	ug/L	100	-	-	-	-	-	-
Bromomethane (Methyl bromide)	ug/L	5.5	-	-	-	-	-	-
Carbon tetrachloride	ug/L	2	-	-	-	-	-	-
Chlorobenzene	ug/L	80	-	-	-	-	-	-
Chloroethane	ug/L	--	-	-	-	-	-	-
Chloroform (Trichloromethane)	ug/L	100	-	-	-	-	-	-
Chloromethane (Methyl chloride)	ug/L	--	-	-	-	-	-	-
cis-1,2-Dichloroethene	ug/L	8	-	-	-	-	-	-
cis-1,3-Dichloropropene	ug/L	--	-	-	-	-	-	-
Dibromochloromethane	ug/L	100	-	-	-	-	-	-
Dichlorodifluoromethane (CFC-12)	ug/L	800	-	-	-	-	-	-
Ethylbenzene	ug/L	140	-	-	-	-	-	-
Hexachlorobutadiene	ug/L	2	-	-	-	-	-	-
Isopropyl benzene	ug/L	400	-	-	-	-	-	-
m&p-Xylenes	ug/L	--	-	-	-	-	-	-
Methyl tert butyl ether (MTBE)	ug/L	95	-	-	-	-	-	-
Methylene chloride	ug/L	50	-	-	-	-	-	-
o-Xylene	ug/L	--	-	-	-	-	-	-
Styrene	ug/L	800	-	-	-	-	-	-
Tetrachloroethene	ug/L	30	-	-	-	-	-	-
Toluene	ug/L	60	-	-	-	-	-	-
trans-1,2-Dichloroethene	ug/L	80	-	-	-	-	-	-
trans-1,3-Dichloropropene	ug/L	--	-	-	-	-	-	-
Trichloroethene	ug/L	5	-	-	-	-	-	-
Trichlorofluoromethane (CFC-11)	ug/L	1000	-	-	-	-	-	-
Trifluorotrichloroethane (CFC-113)	ug/L	100000	-	-	-	-	-	-
Vinyl chloride	ug/L	2	-	-	-	-	-	-
Xylenes (total)	ug/L	90	-	-	-	-	-	-
PAHs								
1-Methylnaphthalene	ug/L	5.5	-	-	-	-	-	-
2-Methylnaphthalene	ug/L	15	-	-	-	-	-	-
Acenaphthene	ug/L	250	-	-	-	-	-	-
Acenaphthylene	ug/L	--	-	-	-	-	-	-
Acridine	ug/L	--	-	-	-	-	-	-
Anthracene	ug/L	1000	-	-	-	-	-	-
Benzo(a)anthracene	ug/L	0.07	-	-	-	-	-	-
Benzo(a)pyrene	ug/L	0.01	-	-	-	-	-	-
Benzo(b)fluoranthene/Benzo(j)fluoranthene	ug/L	0.07	-	-	-	-	-	-
Benzo(b)pyridine (Quinoline)	ug/L	0.05	-	-	-	-	-	-
Benzo(g,h,i)perylene	ug/L	--	-	-	-	-	-	-
Benzo(k)fluoranthene	ug/L	--	-	-	-	-	-	-
Chrysene	ug/L	7	-	-	-	-	-	-
Dibenz(a,h)anthracene	ug/L	0.01	-	-	-	-	-	-
Fluoranthene	ug/L	150	-	-	-	-	-	-
Fluorene	ug/L	150	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	ug/L	--	-	-	-	-	-	-
Naphthalene	ug/L	80	-	-	-	-	-	-
PAH high molecular weight	ug/L	--	-	-	-	-	-	-
PAH low molecular weight	ug/L	--	-	-	-	-	-	-
Phenanthrene	ug/L	--	-	-	-	-	-	-
Pyrene	ug/L	100	-	-	-	-	-	-
Total PAH	ug/L	--	-	-	-	-	-	-

Table 4

Groundwater Analytical Results
2019 Operations and Monitoring Report
for the Original Upland Landfill
Campbell River, British Columbia

Well Location:			Cross-Gradient	Downgradient	Downgradient
Sample Location:			MW10-17	MW11-19	MW11-19
Sample ID:			WG-088877-300919-RP-03	WG-88877-070519-DB-01	WG-088877-300919-RP-01
Sample Date:		BC CSR[1]	9/30/2019	5/7/2019	9/30/2019
		DW	Duplicate[2]		
Parameters	**Units**				
Field Parameters					
Conductivity, field	uS/cm	--	133	151	440
Oxidation reduction potential (ORP), field	millivolts	--	171	184	161
pH, field	s.u.	--	8.11	7.33	7.49
Temperature, field	Deg C	--	11.52	16.59	14.11
Total dissolved solids, field (TDS)	g/L	--	0.087	0.098	0.276
Turbidity, field	NTU	--	16	597	OOR
General Chemistry					
Alkalinity (as CaCO3 pH=8.3)	mg/L	--	ND (1.0)	ND (1.0)	ND (1.0)
Alkalinity, total (as CaCO3)	mg/L	--	65	69.1	280
Chemical oxygen demand (COD)	mg/L	--	-	43	-
Chloride (dissolved)	mg/L	250	-	10	2.4
Conductivity, lab	uS/cm	--	150	175	530
Hardness (dissolved)	mg/L	--	-	68.4	258
Hydrogen sulfide	mg/L	0.05	-	0.026	ND (0.019)
Hydroxide (as CaCO3)	mg/L	--	ND (1.0)	ND (1.0)	ND (1.0)
Orthophosphate	mg/L	--	-	-	0.0093
pH	s.u.	--	7.12 J	7.91	7.82 J
Sulfate (dissolved)	mg/L	500	-	5.7	8.9
Sulfide	mg/L	0.05 *ref only	-	0.025	ND (0.018)
Total dissolved solids (TDS)	mg/L	--	-	128	320
Total suspended solids (TSS)	mg/L	--	-	1100	-
Nutrients					
Ammonia-N	mg/L	--	-	0.034	0.029
Bicarbonate (as CaCO3)	mg/L	--	79	84.3	340
Carbonate (as CaCO3)	mg/L	--	ND (1.0)	ND (1.0)	ND (1.0)
Nitrate (as N)	mg/L	10	-	-	1.01
Nitrite (as N)	mg/L	1	ND (0.10)	-	ND (0.10)
Nitrite/Nitrate	mg/L	10	0.38	-	1.01
Dissolved Metals					
Aluminum (dissolved)	ug/L	9500	-	142	ND (3.0)
Antimony (dissolved)	ug/L	6	-	ND (0.50)	ND (0.50)
Arsenic (dissolved)	ug/L	10	-	0.39	0.32
Barium (dissolved)	ug/L	1000	-	6.5	24.3
Beryllium (dissolved)	ug/L	8	-	ND (0.10)	ND (0.10)
Bismuth (dissolved)	ug/L	--	-	ND (1.0)	ND (1.0)
Boron (dissolved)	ug/L	5000	-	ND (50)	ND (50)
Cadmium (dissolved)	ug/L	5	-	ND (0.010)	ND (0.010)
Calcium (dissolved)	ug/L	--	-	22000	81800
Chromium (dissolved)	ug/L	50	-	1.5	1.2
Cobalt (dissolved)	ug/L	20 (i)	-	0.24	ND (0.20)
Copper (dissolved)	ug/L	1500	-	1.04	0.51
Iron (dissolved)	ug/L	6500	-	190	ND (5.0)
Lead (dissolved)	ug/L	10	-	ND (0.20)	ND (0.20)
Lithium (dissolved)	ug/L	8	-	ND (2.0)	ND (2.0)
Magnesium (dissolved)	ug/L	--	-	3280	13000
Manganese (dissolved)	ug/L	1500	-	26	18.7
Mercury (dissolved)	ug/L	1	-	ND (0.0020)	ND (0.0020)
Molybdenum (dissolved)	ug/L	250	-	ND (1.0)	ND (1.0)
Nickel (dissolved)	ug/L	80	-	ND (1.0)	ND (1.0)
Potassium (dissolved)	ug/L	--	-	495	746
Selenium (dissolved)	ug/L	10	-	0.15	0.27
Silicon (dissolved)	ug/L	--	-	6960	9340
Silver (dissolved)	ug/L	20	-	ND (0.020)	ND (0.020)
Sodium (dissolved)	ug/L	200000	-	6820	12900
Strontium (dissolved)	ug/L	2500	-	53.3	148
Sulfur (dissolved)	ug/L	--	-	ND (3000)	ND (3000)
Thallium (dissolved)	ug/L	--	-	ND (0.010)	ND (0.010)
Tin (dissolved)	ug/L	2500	-	ND (5.0)	ND (5.0)
Titanium (dissolved)	ug/L	--	-	9.3	ND (5.0)
Uranium (dissolved)	ug/L	20	-	0.13	0.45
Vanadium (dissolved)	ug/L	20	-	ND (5.0)	ND (5.0)
Zinc (dissolved)	ug/L	3000	-	ND (5.0)	ND (5.0)
Zirconium (dissolved)	ug/L	--	-	ND (0.10)	ND (0.10)
Petroleum Products					
VHw6-10	ug/L	15000	-	ND (300)	ND (300)
VPHw	ug/L	--	-	ND (300)	ND (300)
Volatile Organic Compounds					
1,1,1,2-Tetrachloroethane	ug/L	6	-	-	ND (0.50)
1,1,1-Trichloroethane	ug/L	8000	-	-	ND (0.50)
1,1,2,2-Tetrachloroethane	ug/L	0.8	-	-	ND (0.50)
1,1,2-Trichloroethane	ug/L	3	-	-	ND (0.50)
1,1-Dichloroethane	ug/L	30	-	-	ND (0.50)
1,1-Dichloroethene	ug/L	14	-	-	ND (0.50)
1,2,3-Trichlorobenzene	ug/L	3	-	-	ND (2.0)
1,2,4-Trichlorobenzene	ug/L	5.5	-	-	ND (2.0)
1,2-Dibromoethane (Ethylene dibromide)	ug/L	0.5	-	-	ND (0.20)
1,2-Dichlorobenzene	ug/L	200	-	-	ND (0.50)
1,2-Dichloroethane	ug/L	5	-	-	ND (0.50)
1,2-Dichloropropane	ug/L	4.5	-	-	ND (0.50)
1,3,5-Trimethylbenzene	ug/L	40	-	-	ND (2.0)
1,3-Butadiene	ug/L	1	-	-	ND (0.50)
1,3-Dichlorobenzene	ug/L	--	-	-	ND (0.50)
1,3-Dichloropropane	ug/L	80	-	-	ND (1.0)
1,4-Dichlorobenzene	ug/L	5	-	-	ND (0.50)
Benzene	ug/L	5	-	ND (0.40)	ND (0.40)
Bromobenzene	ug/L	30	-	-	ND (2.0)
Bromodichloromethane	ug/L	100	-	-	ND (1.0)
Bromoform	ug/L	100	-	-	ND (1.0)
Bromomethane (Methyl bromide)	ug/L	5.5	-	-	ND (1.0)
Carbon tetrachloride	ug/L	2	-	-	ND (0.50)
Chlorobenzene	ug/L	80	-	-	ND (0.50)
Chloroethane	ug/L	--	-	-	ND (1.0)
Chloroform (Trichloromethane)	ug/L	100	-	-	ND (1.0)
Chloromethane (Methyl chloride)	ug/L	--	-	-	ND (1.0)
cis-1,2-Dichloroethene	ug/L	8	-	-	ND (1.0)
cis-1,3-Dichloropropene	ug/L	--	-	-	ND (1.0)
Dibromochloromethane	ug/L	100	-	-	ND (1.0)
Dichlorodifluoromethane (CFC-12)	ug/L	800	-	-	ND (2.0)
Ethylbenzene	ug/L	140	-	ND (0.40)	ND (0.40)
Hexachlorobutadiene	ug/L	2	-	-	ND (0.50)
Isopropyl benzene	ug/L	400	-	-	ND (2.0)
m&p-Xylenes	ug/L	--	-	ND (0.40)	ND (0.40)
Methyl tert butyl ether (MTBE)	ug/L	95	-	ND (4.0)	ND (4.0)
Methylene chloride	ug/L	50	-	-	ND (2.0)
o-Xylene	ug/L	--	-	ND (0.40)	ND (0.40)
Styrene	ug/L	800	-	ND (0.40)	ND (0.50)
Tetrachloroethene	ug/L	30	-	-	ND (0.50)
Toluene	ug/L	60	-	ND (0.40)	ND (0.40)
trans-1,2-Dichloroethene	ug/L	80	-	-	ND (1.0)
trans-1,3-Dichloropropene	ug/L	--	-	-	ND (1.0)
Trichloroethene	ug/L	5	-	-	ND (0.50)
Trichlorofluoromethane (CFC-11)	ug/L	1000	-	-	ND (4.0)
Trifluorotrichloroethane (CFC-113)	ug/L	100000	-	-	ND (2.0)
Vinyl chloride	ug/L	2	-	-	ND (0.50)
Xylenes (total)	ug/L	90	-	ND (0.40)	ND (0.40)
PAHs					
1-Methylnaphthalene	ug/L	5.5	-	ND (0.050)	ND (0.050)
2-Methylnaphthalene	ug/L	15	-	ND (0.10)	ND (0.10)
Acenaphthene	ug/L	250	-	ND (0.050)	ND (0.050)
Acenaphthylene	ug/L	--	-	ND (0.050)	ND (0.050)
Acridine	ug/L	--	-	ND (0.050)	ND (0.050)
Anthracene	ug/L	1000	-	ND (0.010)	ND (0.010)
Benzo(a)anthracene	ug/L	0.07	-	ND (0.010)	ND (0.010)
Benzo(a)pyrene	ug/L	0.01	-	ND (0.0050)	ND (0.0050)
Benzo(b)fluoranthene/Benzo(j)fluoranthene	ug/L	0.07	-	ND (0.030)	ND (0.030)
Benzo(b)pyridine (Quinoline)	ug/L	0.05	-	ND (0.020)	ND (0.020)
Benzo(g,h,i)perylene	ug/L	--	-	ND (0.050)	ND (0.050)
Benzo(k)fluoranthene	ug/L	--	-	ND (0.050)	ND (0.050)
Chrysene	ug/L	7	-	ND (0.020)	ND (0.020)
Dibenz(a,h)anthracene	ug/L	0.01	-	ND (0.0030)	ND (0.0030)
Fluoranthene	ug/L	150	-	ND (0.020)	ND (0.020)
Fluorene	ug/L	150	-	ND (0.050)	ND (0.050)
Indeno(1,2,3-cd)pyrene	ug/L	--	-	ND (0.050)	ND (0.050)
Naphthalene	ug/L	80	-	ND (0.10)	ND (0.10)
PAH high molecular weight	ug/L	--	-	ND (0.050)	ND (0.050)
PAH low molecular weight	ug/L	--	-	ND (0.10)	ND (0.10)
Phenanthrene	ug/L	--	-	ND (0.050)	ND (0.050)
Pyrene	ug/L	100	-	ND (0.020)	ND (0.020)
Total PAH	ug/L	--	-	ND (0.10)	ND (0.10)

Table Notes

2019 Operations and Monitoring Report for the Original Upland Landfill Campbell River, British Columbia

Notes:

(1)	British Columbia Contaminated Site Regulation (Nov 2017) Column 6 for the protection of drinking water (DW).
(2)	Field duplicate was created but not required by monitoring specification. Only limited analysis performed.
ND	Not detected at the associated reporting limit.
J	Estimated concentration.
OOR	Out of range.
(i)	Cobalt concentrations in groundwater do not exceed the referenced cobalt interim background groundwater concentration estimate. Standard confirmed in email received from ENV, November 7, 2017.
J	The analyte was positively identified; the associated numerical value is the estimated concentration of the analyte in the sample.
	Exceeds standard.
ND (10)	Detection limit exceeds standard.
--	Currently no standard.

Appendices

Appendix A
Operational Certificate

August 1, 2019

Tracking Number: 335965
Authorization Number: 107689

REGISTERED MAIL

UPLAND EXCAVATING LTD.
#201-909 ISLAND HIGHWAY
CAMPBELL RIVER BC V9W 2C2

Dear operational certificate holder:

Enclosed is Operational Certificate 107689 issued under the provisions of the *Environmental Management Act*. Your attention is respectfully directed to the terms and conditions outlined in the operational certificate. An annual fee will be determined according to the Permit and Approval Fees and Charges Regulation.

This operational certificate does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority rests with the operational certificate holder. It is also the responsibility of the operational certificate holder to ensure that all activities conducted under this authorization are carried out with regard to the rights of third parties, and comply with other applicable legislation that may be in force.

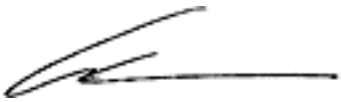
Requirements may also be specified by the *Environmental Management Act* and regulations including, but not limited to, the Contaminated Sites Regulation, Environmental Data Quality Assurance Regulation, Hazardous Waste Regulation, Landfill Gas Management Regulation, Organic Matter Recycling Regulation, Ozone Depleting Substances and Other Halocarbons Regulation, Recycling Regulation, Spill Reporting Regulation, Storage of Recyclable Material Regulation, Waste Discharge Regulation and Codes of Practice.

This decision may be appealed to the Environmental Appeal Board in accordance with Part 8 of the *Environmental Management Act*. An appeal must be delivered within 30 days from the date that notice of this decision is given. For further information, please contact the Environmental Appeal Board at (250) 387-3464.

Administration of this operational certificate will be carried out by staff from the Environmental Protection Division's Regional Operations Branch. Documents pertinent to the operational certificate are to be submitted by email or electronic transfer to the director, in accordance with the ministry Data & Report Submissions website at: http://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/data-and-report-submissions, or as further instructed.

If you have any questions or concerns, please contact Authorizations - South at Authorizations.South@gov.bc.ca.

Yours truly,



Luc Lachance, P.Eng
for Director, *Environmental Management Act*
Authorizations - South Region

Enclosure

MINISTRY OF ENVIRONMENT &
CLIMATE CHANGE STRATEGY

OPERATIONAL CERTIFICATE

107689

Under the Provisions of the Environmental Management Act

Pursuant to the Approved

Comox Valley Regional District Solid Waste Management Plan

UPLAND EXCAVATING LTD.

#201-909 ISLAND HIGHWAY
CAMPBELL RIVER BC V9W 2C2

Is authorized to manage waste at the Facility located in Campbell River, British Columbia, subject to the requirements listed below. Contravention of any of these requirements is a violation of the *Environmental Management Act* and may lead to prosecution.

Pursuant to section 24(10) of the *Environmental Management Act*, this operational certificate supersedes and cancels Permit PR-10807 issued under section 14 of the *Environmental Management Act*.

1. AUTHORIZED DISCHARGES, FACILITIES AND WORKS

1.1 Original Landfill

This section applies to the Original Landfill.

1.1.1 The maximum rate of waste discharge to the Original Lined Cell is 45,000 tonnes per calendar year.

1.1.2 The characteristics of the waste discharge to the Original Lined Cell must be:

(a) demolition waste,
(b) construction waste,
(c) land clearing waste,
(d) soil in which the concentrations of all substances are less than the lowest applicable industrial land use standard specified for those substances in
(i) the generic numerical soil standards,
(ii) the matrix numerical soil standards, or

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Luc Lachance, P.Eng
for Director, *Environmental Management Act*
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(iii) a director's interim standard for soil,
referred to in section 41(1)(a) of the Contaminated Sites Regulation, B.C. Reg. 375/96,
(e) sludge from the Original Leachate Management Works, or,
(f) other waste as authorized in writing by the director,
but does not include:
(g) hazardous waste except as authorized pursuant to the Hazardous Waste Regulation, controlled waste, Attractants, and,
(h) waste and/or recyclable material prohibited in writing by the director.

1.1.3 The waste discharge is authorized to the Original Lined Cell approximately located as shown on Site Plan A. Waste discharge to the Original Un-Lined Cell is not authorized.

1.1.4 Authorization to discharge waste to the Original Lined Cell ceases on the earlier of:
(i) the date the Original Lined Cell is filled to capacity with grades not steeper than 3H:1V (33%),
(ii) the date of commencement of waste discharge to the New Landfill.

1.1.5 The authorized works are:
(i) a lined landfill footprint with a maximum area of 0.72 ha (85 m x 85 m) including from bottom to top a base with perimeter berm, 0.3 m sand cushion layer, 0.5 mm thick coated woven polyethylene liner, 0.3 m granular leak detection layer, leak detection riser pipe, 0.5 mm thick coated woven polyethylene liner, 0.3 m sand protection layer, leachate extraction chamber, final cover, and,
(ii) an un-lined landfill footprint with an approximate area of 0.7 ha, final cover,
and related appurtenances, approximately located as shown on Site Plan A.

1.1.6 The operational certificate holder must ensure the Original Landfill, excluding final cover, is complete and fully operational on or before the date of issuance of this operational certificate, and at all times thereafter, until the Original Landfill is decommissioned in compliance with the plan referred to in section 2.9(a) (plan to remove all waste from the Original Landfill) of this operational certificate.

1.2 **Original Leachate Management Works**

This section applies to the management of leachate from the Original Lined Cell.

1.2.1 The operational certificate holder must convey the leachate from the Original Lined Cell, that is to be discharged on the Facility site, to the Original Leachate Management Works.

1.2.2 The maximum rate of treated leachate effluent discharge to the treated leachate infiltration pond is 7,139 m^3 per calendar year.

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for Director, *Environmental Management Act*
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1.2.3 The concentration of any substance in the treated leachate effluent discharge to the treated leachate infiltration pond must not be greater than the Contaminated Sites Regulation Generic Numerical Water Standards for Drinking Water (DW), for that substance.

1.2.4 The treated leachate effluent is authorized to be discharged to the treated leachate infiltration pond and infiltrated into the ground. This authorization ceases on the date the Original Leachate Management Works are decommissioned in compliance with the plan referred to in section 2.9(a) (plan to remove all waste from the Original Landfill) of this operational certificate.

1.2.5 The authorized works are leachate conveyance, storage, treatment and discharge works including pumps, pipes, leachate storage and treatment tanks, treated leachate infiltration pond, flow monitoring works, and related appurtenances approximately located as shown on Site Plan A.

1.2.6 Minimum Freeboard must be maintained at all times as follows:
treated leachate infiltration pond: 0.6 m

1.2.7 The operational certificate holder must ensure the Original Leachate Management Works are complete and fully operational on or before the date of commencement of discharge to the treated leachate infiltration pond, and at all times thereafter, until the Original Leachate Management Works are decommissioned in compliance with the plan referred to in section 2.9(a) (plan to remove all waste from the Original Landfill) of this operational certificate.

1.3 **New Landfill**

This section applies to the New Landfill.

1.3.1 The maximum rate of waste discharge to the New Landfill is: (45,000 minus the waste discharge to the Original Lined Cell) tonnes per calendar year.

1.3.2 The characteristics of the waste discharge to the New Landfill must be:
(a) demolition waste,
(b) construction waste,
(c) land clearing waste,
(d) soil in which the concentrations of all substances are less than the lowest applicable industrial land use standard specified for those substances in
(i) the generic numerical soil standards,
(ii) the matrix numerical soil standards, or
(iii) a director's interim standard for soil,
referred to in section 41(1)(a) of the Contaminated Sites Regulation, B.C. Reg. 375/96,
(e) sludge from the New Leachate Management Works or the New Stormwater

Management Works, or,

(f) other waste as authorized in writing by the director,

but does not include:

(g) hazardous waste except as authorized pursuant to the Hazardous Waste Regulation, controlled waste, Attractants, and,

(h) waste and/or recyclable material prohibited in writing by the director.

1.3.3 The waste discharge is authorized to the New Landfill approximately located as shown on Site Plan A.

1.3.4 The authorized works are a lined landfill footprint with a maximum area of 3.60 ha including from bottom to top a base with perimeter berm, secondary base liner, leak detection drainage layer and leak collection pipes and sump, primary base liner, leachate collection drainage layer and leachate collection pipes and sump, pumps, pipes, final cover, and related appurtenances, approximately located as shown on Site Plan A.

1.3.5 The secondary base liner and the primary base liner must each include an upper high density polyethylene double sided textured geomembrane of minimum 1.5 mm thickness and a lower geosynthetic clay liner of hydraulic conductivity less than or equal to 1×10^{-7} cm/s. However, on the south slope of the base more than 1 m above the primary base liner, the geosynthetic clay liners are not required.

1.3.6 The operational certificate holder must ensure the New Landfill, excluding final cover, is complete and fully operational on or before the date of commencement of waste discharge to the New Landfill, and at all times thereafter.

1.4 New Leachate Management Works

This section applies to the management of leachate from the New Landfill.

1.4.1 The operational certificate holder must convey the leachate from the New Landfill, that is to be discharged on the Facility site, to the New Leachate Management Works.

1.4.2 The maximum rate of treated leachate effluent discharge to the treated leachate infiltration pond is 24,633 m^3 per calendar year.

1.4.3 The concentration of any substance in the treated leachate effluent discharge to the treated leachate infiltration pond must not be greater than the Contaminated Sites Regulation Generic Numerical Water Standards for Drinking Water (DW), for that substance.

1.4.4 The treated leachate effluent is authorized to be discharged to the treated leachate infiltration

pond and infiltrated into the ground.

1.4.5 The authorized works are leachate conveyance, treatment and discharge works including pumps, pipes, leachate treatment pond(s), treated leachate infiltration pond, flow monitoring works, and related appurtenances approximately located as shown on Site Plan A.

1.4.6 The leachate treatment pond(s) must include from bottom to top a secondary base liner, leak detection drainage layer and leak collection pipe(s), and a primary base liner. The secondary base liner and the primary base liner must each include an upper high density polyethylene double sided textured geomembrane of minimum 1.5 mm thickness and a lower geosynthetic clay liner of hydraulic conductivity less than or equal to 1×10^{-7} cm/s.

1.4.7 Minimum Freeboard must be maintained at all times as follows:
leachate treatment pond(s): 0.6 m
treated leachate infiltration pond: 0.6 m

1.4.8 The operational certificate holder must ensure the New Leachate Management Works are complete and fully operational on or before the date of commencement of waste discharge to the New Landfill, and at all times thereafter.

1.5 **New Stormwater Management Works**

This section applies to the management of stormwater from the New Landfill.

1.5.1 The operational certificate holder must manage stormwater from the New Landfill such that stormwater is infiltrated into the ground with the authorized works.

1.5.2 The stormwater must not include leachate and the concentration of any substance in the stormwater must not be greater than the Contaminated Sites Regulation Generic Numerical Water Standards for Drinking Water (DW), for that substance.

1.5.3 The authorized works are diversion berm, perimeter berm, mid slope swales, drop down channels, ditches, energy dissipation and sediment traps, stormwater infiltration area, and related appurtenances approximately located as shown on Site Plan A.

1.5.4 Minimum Freeboard must be maintained at all times as follows:
stormwater infiltration area: 0.6 m
all other authorized works: 0.3 m

1.5.5 The operational certificate holder must ensure that adequate authorized works to manage stormwater, such that stormwater is infiltrated into the ground with the authorized works, are

complete and fully operational on or before the date of commencement of waste discharge to the New Landfill, and at all times thereafter.

1.6 Facility Entrance

This section applies to the Facility entrance.

1.6.1 The authorized works are sign(s), gate, fence, weigh scale, and related appurtenances approximately located as shown on Site Plan A.

1.6.2 The operational certificate holder must ensure the authorized works are complete and fully operational on or before the date of issuance of this operational certificate and at all times thereafter.

1.7 Location of Facility

This section applies to the location of the Facility.

1.7.1 The location of the Facility is PID 001-223-321, LOT A, DISTRICT LOT 85, SAYWARD DISTRICT, PLAN 30709 EXCEPT PART IN PLAN EPP15087, approximately located as shown on Site Plan A.

2. GENERAL REQUIREMENTS

2.1 Glossary

The following capitalized terms referred to in this authorization are defined in the Glossary below. Other terms used in this authorization have the same meaning as those defined in the *Environmental Management Act*, applicable regulations, and the Landfill Criteria;

"Attractant" means food or food waste, compost, carcass or part of an animal, fish, or other meat, or other waste or garbage, that could attract bears, birds, rodents, insects, vectors or wildlife, but does not include grass, leaves, weeds, branches and woodwaste;

"Facility" means the Original Landfill, Original Leachate Management Works, New Landfill, New Leachate Management Works, New Stormwater Management Works and the authorized works in section 1.6.1 (Facility Entrance) of this operational certificate;

"Freeboard" means the difference in elevation between the contained liquid level and the top of the containment works at its lowest point;

"Landfill Criteria" means the Landfill Criteria for Municipal Solid Waste Second Edition June 2016, as amended or replaced from time to time;

"New Landfill" means the authorized works in section 1.3.4 of this operational certificate;

"New Leachate Management Works" means the authorized works in section 1.4.5 of this operational certificate;

"New Stormwater Management Works" means the authorized works in section 1.5.3 of this operational certificate;

"Original Landfill" means the Original Lined Cell and the Original Un-Lined Cell;

"Original Leachate Management Works" means the authorized works in section 1.2.5 of this operational certificate;

"Original Lined Cell" means the authorized works in section 1.1.5(i) of this operational certificate;

"Original Un-Lined Cell" means the authorized works in section 1.1.5(ii) of this operational certificate;

"Province" means Her Majesty the Queen in right of British Columbia;

"Regulatory Document" means any document that the operational certificate holder is required to cause to be prepared, prepare or submit to the director or the Province, pursuant to: (i) this authorization; (ii) any regulation made under the *Environmental Management Act* that regulates the Facility described in this authorization or the discharge of waste from that Facility; or (iii) any order issued under the *Environmental Management Act* directed against the operational certificate holder that is related to the Facility described in this authorization or the discharge of waste from that Facility;

"Significant Works" means the Facility excluding the authorized works in section 1.6.1 (Facility Entrance) of this operational certificate.

2.2 **Use of Qualified Professional(s)**

The operational certificate holder must cause a Qualified Professional to:

(a) Design and inspect the construction of the Facility, and,

(b) Certify documents related to the Facility including plans, specifications, drawings, construction

reports, assessments, reviews, investigations, studies, surveys, programs, reports and as-built record drawings.

(d) Submit a completed Declaration of Competency and a Conflict of Interest Disclosure Statement with each document.

2.3 Operations and Closure Plan (OCP)

(a) The operational certificate holder must cause a Qualified Professional to certify and submit an up to date OCP for the Original Landfill and the Original Leachate Management Works, to the director, on or before the earlier of:

(i) 30 days before the date of commencement of waste discharge to the Original Lined Cell,
(ii) 30 days after the date of issuance of this operational certificate.

(b) The OCP must comply with the requirements of this operational certificate, include information specified in relevant items listed in the Landfill Criteria Section 10.3 Design, Operations and Closure Plan including a site layout plan, a filling plan, a lifespan analysis table, a stormwater management plan, a leachate management plan, an environmental monitoring plan, an operations plan, a closure plan, and the information specified in the following sections of this operational certificate:

2.7(a) (soil acceptance plan), and,
2.10(a) (financial security plan).

(c) The operational certificate holder must carry out the most recent OCP and design, construct, operate, inspect, maintain, monitor and close the Original Landfill and the Original Leachate Management Works, in compliance with the most recent OCP and this operational certificate, until the Original Landfill and the Original Leachate Management Works are decommissioned in compliance with the plan referred to in section 2.9(a) (plan to remove all waste from the Original Landfill) of this operational certificate.

2.4 Hydrogeology and Hydrology Characterization Report (HHCR)

(a) The operational certificate holder must cause a Qualified Professional to certify and submit an up to date HHCR, to the director, on or before 90 days before the date of commencement of waste discharge to the New Landfill.

(b) The HHCR must include characterization of the geology, hydrogeology, and surface hydrology at and near the Facility site, and the information specified in all the items listed in the Landfill Criteria, section 10.1 Hydrogeology and Hydrology Characterization Report.

(c) The operational certificate holder must cause a Qualified Professional to certify and submit an updated HHCR to the director, at least once every five years after the date of commencement of waste

discharge to the New Landfill.

2.5 Design, Operations and Closure Plan (DOCP)

(a) The operational certificate holder must cause a Qualified Professional to certify and submit an up to date DOCP, for the Facility, to the director, on or before 90 days before the date of commencement of waste discharge to the New Landfill.

(b) The DOCP must comply with the requirements of this operational certificate, include the information specified in all the items listed in the Landfill Criteria Section 10.3 Design, Operations and Closure Plan, and the information specified in the following sections of this operational certificate:

2.6(a) (New Leachate Management Works commissioning plan),
2.7(a) (soil acceptance plan),
2.8(a) (trigger level assessment plan),
2.9(a) (plan to remove all waste from the Original Landfill), and,
2.10(b) (financial security plan).

(c) The operational certificate holder must cause a Qualified Professional to certify and submit an updated DOCP to the director, as necessary to keep the DOCP up to date, at least once every five years after the date of commencement of waste discharge to the New Landfill.

(d) The operational certificate holder must carry out the most recent DOCP and design, construct, operate, inspect, maintain, monitor, and close the Facility, in compliance with most recent DOCP and this operational certificate.

2.6 New Leachate Management Works Commissioning Plan and Report

(a) The DOCP submitted pursuant to section 2.5 of this operational certificate must include a New Leachate Management Works commissioning plan that includes:

(i) the expected duration of the New Leachate Management Works commissioning period,
(ii) description of the New Leachate Management Works and design, including treatment of leachate from soil and treated leachate infiltration pond design and infiltration tests,
(iii) the monitoring, sampling and analyses that will be carried out during the New Leachate Management Works commissioning period including the quantity and quality of leachate and treated leachate effluent, and confirmatory sampling before the discharge of any treated leachate effluent to the treated leachate infiltration pond,
(iv) operating procedures that will be carried out during the New Leachate Management Works commissioning period including review of confirmatory sampling results before the discharge of any treated leachate effluent to the treated leachate infiltration pond,
(v) contingency measures that will be carried out during the New Leachate Management Works

commissioning period if the treated leachate effluent quality does not comply with this operational certificate, including storage, retreatment, and transport to an off-site authorized treatment facility,
(vi) New Leachate Management Works commissioning report description, table of contents and summary of contents.

(b) The operational certificate holder must cause a Qualified Professional to certify and submit a New Leachate Management Works commissioning report, that includes the information contemplated in section 2.6(a)(vi) of this operational certificate, to the director, on or before 30 days after the completion of the New Leachate Management Works commissioning period, or as specified by the director.

2.7 Soil Acceptance Plan

(a) The OCP submitted pursuant to section 2.3, and the DOCP submitted pursuant to section 2.5, of this operational certificate, must include a soil acceptance plan that includes procedures that will be carried out before soil is accepted at the Facility including receipt and review of documents required by section 2.7(b) of this operational certificate, and consideration of the applicable Original Leachate Management Works or New Leachate Management Works adequacy to treat leachate from the soil.

(b) Before a specific quantity of soil is accepted at the Facility, the operational certificate holder must cause a Qualified Professional to certify and submit to the operational certificate holder, a document pertaining to the specific quantity of soil that includes:
(i) the soil tonnage(s) and soil quality class(es) as described in the most recent version of Technical Guidance 1 on Contaminated Sites Site Characterization and Confirmation Testing,
(ii) the soil origin including applicable civic address, site identification number, parcel identifier, parcel identification number, legal description, and,
(iii) characterization of the soil in accordance with ministry procedures and applicable Contaminated Sites Regulation Guidance, Protocols and Procedures.

2.8 Trigger Level Assessment Plan

(a) The DOCP submitted pursuant to section 2.5 of this operational certificate must include a trigger level assessment plan that includes:
(i) Description of the routine monitoring of the quantity and quality of leachate leakage through the primary liner and into the leak detection layer for the New Landfill, and for the leachate treatment pond(s), and related leachate leakage quantities and qualities that will trigger corresponding described increased monitoring, investigations, contingency measures and actions.
(ii) Description of the routine monitoring of groundwater quality immediately downgradient of the New Landfill, the leachate treatment pond(s), and the treated leachate infiltration pond, and related groundwater substance concentrations that will trigger corresponding described increased

monitoring, investigations, contingency measures and actions.

2.9 Plan to Remove all Waste from the Original Landfill

(a) The DOCP submitted pursuant to section 2.5 of this operational certificate must include a plan to remove all waste from the Original Landfill, categorize such waste, discharge all such waste to the New Landfill or to other identified and authorized waste management facility(ies), carry out sampling to confirm all such waste has been removed, and decommission the Original Landfill and the Original Leachate Management Works.

(b) Subject to section 1.3.2 of this operational certificate, waste removed from the Original Landfill is authorized to be discharged to the New Landfill. The tonnage of such waste must not be included for the purpose of determining compliance with section 1.3.1 of this operational certificate.

(c) The director may require the operational certificate holder to carry out and complete the plan referred to in section 2.9(a) of this operational certificate, in accordance with the director's requirements.

(d) If the plan referred to in section 2.9(a) of this operational certificate is carried out, the operational certificate holder must cause a Qualified Professional to certify and submit a report to the director that confirms that the plan has been carried out and completed in accordance with the director's requirements, describes the plan implementation, describes and provides the waste categorization, describes and provides the sampling and results, describes the decommissioning of the Original Landfill and the Original Leachate Management Works, provides photos documenting the implementation of the plan referred to in section 2.9(a) of this operational certificate, and lists the tonnages or volumes, and categories of waste removed and discharged to the New Landfill and to other identified and authorized waste management facility(ies), on or before 60 days after the plan referred to in section 2.9(a) of this operational certificate has been carried out and completed.

2.10 Financial Security

(a) The OCP submitted pursuant to section 2.3 of this operational certificate must include a financial security plan that includes:

(i) the calculations of the amounts of financial security and time periods for each phase of development for the Original Landfill in accordance with the Landfill Criteria Section 8.0 Financial Security, and,

(ii) the amounts of financial security for the corresponding time periods.

(b) The DOCP submitted pursuant to section 2.5 of this operational certificate must include a financial security plan that includes:

(i) the tasks, estimated costs, contingency costs, calculations of the amounts of financial security

and time periods, to carry out and complete the plan referred to in section 2.9(a) of this operational certificate (plan to remove all waste from the Original Landfill),
(ii) the calculations of the amounts of financial security and time periods for each phase of development for the New Landfill in accordance with the Landfill Criteria Section 8.0 Financial Security, and,
(iii) the amounts of financial security for the corresponding time periods.

(c) The operational certificate holder must provide the director with financial security, on or before the earlier of:
(i) 30 days before the date of commencement of waste discharge to the Original Lined Cell,
(ii) 30 days after the date of issuance of this operational certificate,
(iii) 90 days before the date of commencement of waste discharge to the New Landfill,
and at all times thereafter.

(d) The amount of financial security at any time must be equal to or greater than:
(i) Before the report referred to in section 2.9(d) (report that confirms that the plan referred to in section 2.9(a) of this operational certificate has been carried out and completed) of this operational certificate is submitted to the director, the greater amount specified for the corresponding time period in:
- the financial security plan in the most recent OCP,
- the financial security plan in the most recent DOCP.
(ii) On and after the report referred to in section 2.9(d) (report that confirms that the plan referred to in section 2.9(a) of this operational certificate has been carried out and completed) of this operational certificate is submitted to the director, the amount specified for the corresponding time period in the financial security plan in the most recent DOCP.

(e) The form of financial security must be satisfactory to the director.

(f) At the discretion of the director, such financial security may be used among other things:
(i) to correct any inadequacy of the Facility relating to its design, construction, operation, inspection, maintenance, monitoring, closure, and post-closure;
(ii) to correct any default in compliance with this operational certificate or the *Environmental Management Act*; and,
(iii) for remediation of the Facility.

(g) The operational certificate holder must replenish any amounts drawn from the posted financial security within 60 days of such amounts being drawn or as otherwise specified by the director.

2.11 **Construction Report(s)**

(a) The operational certificate holder must cause a Qualified Professional to carry out inspections

Date issued: August 1, 2019

Luc Lachance, P.Eng
for Director, *Environmental Management Act*
Authorizations - South Region

before and during the construction or modification of Significant Works, and, after the completion of construction or modification of Significant Works, to certify and submit construction report(s) to the director:

(i) for construction of the New Landfill and the New Leachate Management Works, on or before 30 days before the date of commencement of waste discharge to those new Significant Works, and,
(ii) for all Significant Works, on or before 60 days after the completion of construction or modification of the Significant Works.

(b) The construction report(s) must demonstrate that the Significant Works have been constructed in accordance with this operational certificate and the applicable most recent OCP or DOCP, describe any technical concerns that arose from the inspections and testing and how they were addressed, and include as-built record drawings of the constructed Significant Works, all the inspection and testing reports and results including geologic inspection report, quality control and quality assurance testing, soil test data including field and laboratory data, as described in the Landfill Criteria section 10.2 Construction Report(s).

2.12 **Notification of Commencement of Waste Discharge**

The operational certificate holder must notify the director of:
(a) the date of commencement of waste discharge to the Original Lined Cell, on that date,
(b) the date of commencement of waste discharge to the New Landfill, on that date,
(c) the date the Original Lined Cell has reached capacity, on that date, and,
(d) the date the plan referred to in section 2.9(a) of this operational certificate has been carried out and completed, on that date.

2.13 **Buffer Zone**

The operational certificate holder must ensure that the New Landfill, New Leachate Management Works, and New Stormwater Management Works, are located a minimum of 50 m from the Facility site boundary.

2.14 **Depth to Groundwater**

The operational certificate holder must ensure that the New Landfill secondary base liner, and the New Leachate Management Works leachate treatment pond(s) secondary base liner, are a minimum of 1.5 m above groundwater at all times.

2.15 **Covenant**

On or before the date of commencement of waste discharge to the New Landfill, the operational certificate holder must register a covenant under section 219 (1) of the *Land Title Act*, in a form

acceptable to the director, that binds successors in title to uphold the continued implementation of the closure plan in the most recent DOCP, and prohibits development of the Facility other than as contemplated by this operational certificate or approved by the director. Such covenant must include an acknowledgement that the property was used for the purpose of waste disposal, must be registered as a charge against title to the property on which the facility is located and must be registered in priority to all charges except charges which do not give the holders any rights which might conflict with the covenant.

2.16 Additional Requirements

The director may require the operational certificate holder to:

(a) Cause a Qualified Professional to certify and submit to the director additional, amended or improved documents of the Facility including plans, specifications, drawings, construction reports, assessments, reviews, investigations, studies, surveys, programs, reports and as-built record drawings.

(b) Carry out actions in accordance with the additional, amended or improved documents submitted, and additional actions as specified.

(c) Repair, alter, remove, improve or add to existing facilities and works, or construct new facilities and works, at the Facility.

(d) Temporarily or permanently cease waste discharge to the Original Lined Cell and/or the New Landfill, cover part(s) or all of the Original Landfill and/or the New Landfill with final cover, and close and decommission the Facility, as specified.

2.17 Authorization Requirements

Where this authorization provides that the director may specify a matter or require an action to be carried out, the operational certificate holder must comply with the specification and carry out the action in accordance with the requirements of the director.

3. OPERATING AND PERFORMANCE REQUIREMENTS

3.1 Multiple and/or Spare Works and Auxiliary Power Facilities

The operational certificate holder must provide and install multiple and/or spare works and auxiliary power facilities to ensure the Original Lined Cell, Original Leachate Management Works, New Landfill, New Leachate Management Works, and New Stormwater Management Works, are complete and fully operational as specified in this operational certificate, including during maintenance, breakdowns and electrical power outages.

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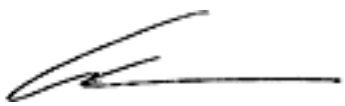

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3.2 Maintenance of the Facility

(a) The operational certificate holder must cause persons that are qualified and trained to operate, regularly inspect, and maintain the Facility, in good working order. If components of the Facility have a manufacturer's recommended maintenance schedule, then those components must, at a minimum, be maintained in accordance with that schedule.

(b) The operational certificate holder must prepare documents of the qualification and training of the persons operating, inspecting and maintaining the Facility, and of Facility inspections, operation and maintenance.

3.3 Facility Manager and Operator Certification

(a) The operational certificate holder must ensure that at least one person responsible for the management of the Facility is certified, and maintains certification, by The Solid Waste Association of North America (SWANA) as a Manager of Landfill Operations, and at least one person responsible for the operation of the Facility has, within the preceding five years, successfully completed the SWANA Landfill Operations Basics course, on or before the earlier of:

(i) the date of commencement of waste discharge to the Original Lined Cell,

(ii) the date of commencement of waste discharge to the New Landfill,

and at all times thereafter.

(b) The operational certificate holder must prepare documents of the SWANA certification and training of the person(s) responsible for the management and operation of the Facility.

3.4 New Leachate Management Works Classification and Operator Certification

(a) The operational certificate holder must have the New Leachate Management Works classified by the Environmental Operators Certification Program (EOCP), on or before the date of commencement of waste discharge to the New Landfill, and at all times thereafter.

(b) The operational certificate holder must ensure that the person(s) responsible for the operation and maintenance of the New Leachate Management Works is(are) certified at an EOCP certification level equivalent to or higher than the EOCP classification level of the New Leachate Management Works, on or before the date of commencement of waste discharge to the New Landfill, and at all times thereafter.

(c) The operational certificate holder must prepare documents of the EOCP classification level of the New Leachate Management Works and the EOCP certification level(s) of the person(s) responsible for the operation and maintenance of the New Leachate Management Works.

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3.5 Groundwater Quality

(a) The operational certificate holder must ensure that the Facility does not cause the concentration of any substance in groundwater flowing from the Facility site boundary to be greater than:

(i) the Contaminated Sites Regulation Generic Numerical Water Standards for Drinking Water (DW), for that substance,

or,

(ii) if the local background concentration of any substance is greater than (i), the local background concentration of that substance.

(b) If section 3.5(a)(ii) of this operational certificate is being used, the operational certificate holder must cause a Qualified Professional to determine the local background concentration of substance(s) in (a), in accordance with the latest approved version of Protocol 9 for Contaminated Sites, Determining Background Groundwater Quality, and include such determination(s) in the Annual Operations and Monitoring Report.

(c) The director may specify more stringent groundwater quality standards than those set out in this section.

3.6 Landfill Gas Management

The operational certificate holder must ensure that:

(a) The Facility does not cause:

(i) combustible gas concentrations to exceed the lower explosive limit of methane (5 percent by volume), or a lower concentration specified by the director, in soil at the Facility site boundary;

(ii) combustible gas concentrations to exceed 20 percent of the lower explosive limit of methane (1 percent by volume) in any building; and

(iii) federal, provincial, or local ambient air quality objectives and standards to be exceeded in air at the Facility site boundary.

(b) Landfill gas is managed in accordance with all migration and health and safety requirements.

3.7 Nuisance

The operational certificate holder must ensure that the Facility does not cause a nuisance including with regard to birds, rodents, insects, odour, noise, dust, litter, vector and wildlife attraction.

3.8 Complaints

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The operational certificate holder must prepare documents of complaints with regard to matters relevant to this operational certificate, including environmental and nuisance complaints. These documents must include the source and nature of the complaint, actions, responses, and corresponding dates and times.

3.9 Regulatory Documents

(a) The operational certificate holder must retain all Regulatory Documents.

(b) The operational certificate holder must retain all Regulatory Documents for the last seven years at the Facility and such documents must be available for immediate inspection at the Facility by a director or an officer.

(c) If requested by a director or an officer, the operational certificate holder must submit the requested Regulatory Documents to the director or officer within 14 days of the request.

4. SAMPLING REQUIREMENTS

4.1 Sampling Procedures

The operational certificate holder must carry out required sampling in accordance with the procedures described in the "British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples, 2013 Edition (Permittee)" or most recent edition, or by alternative procedures as authorized by the director. A copy of the above manual is available on the Ministry web page at https://www2.gov.bc.ca/gov/content/environment/research-monitoring-reporting/monitoring/laboratory-standards-quality-assurance.

4.2 Analytical Procedures

The operational certificate holder must carry out required analyses in accordance with procedures described in the "British Columbia Laboratory Manual (2015 Permittee Edition)", or the most recent edition or by alternative procedures as authorized by the director. A copy of the above manual is available on the Ministry web page at https://www2.gov.bc.ca/gov/content/environment/research-monitoring-reporting/monitoring/laboratory-standards-quality-assurance.

4.3 Quality Assurance

(a) The operational certificate holder must obtain from the analytical laboratory(ies) their precision, accuracy and blank data for each sample set submitted by the operational certificate holder and an evaluation of the data acceptability, based on criteria set by such laboratory.

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(b) The operational certificate holder must submit samples to analytical laboratory(ies) that meet the definition of a qualified laboratory under the Environmental Data Quality Assurance Regulation.

(c) The operational certificate holder must collect, prepare and submit for analysis by the analytical laboratory(ies) quality control (QC) samples for each parameter. As a minimum,

(i) The number of QC samples should be 20% of all samples collected (environmental + QC samples) within 48 hours of each other, and

(ii) Include duplicate, field and trip blank samples for each parameter.

5. REPORTING REQUIREMENTS

5.1 Routine Reporting

The operational certificate holder must submit all routine Regulatory Documents required by this operational certificate by email to the Ministry's Routine Environmental Reporting Submission Mailbox at EnvAuthorizationsReporting@gov.bc.ca or as otherwise instructed by the director. For guidelines on how to properly name the files and email subject lines or for more information visit the Ministry website http://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/data-and-report-submissions/routine-environmental-reporting-submission-mailbox.

5.2 Non-compliance Notification

(a) The operational certificate holder must immediately notify the director or designate by email at EnvironmentalCompliance@gov.bc.ca, or as otherwise instructed by the director of any non-compliance with the requirements of this authorization by the operational certificate holder and must take remedial action to remedy any effects of such non-compliance.

(b) The operational certificate holder must provide the director with written confirmation of all such non-compliance events, including available test results within 24 hours of the original notification by email at EnvironmentalCompliance@gov.bc.ca, or as otherwise instructed by the director.

5.3. Non-compliance Reporting

(a) If the operational certificate holder fails to comply with any of the requirements of this authorization, the operational certificate holder must, within 30 days of such non-compliance, submit to the director a written report that is satisfactory to the director and includes, but is not necessarily limited to, the following:

(i) all relevant test results obtained by the operational certificate holder related to the non-compliance,

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(ii) an explanation of the most probable cause(s) of the non-compliance, and
(iii) a description of remedial action planned and/or taken by the operational certificate holder to prevent similar non-compliance(s) in the future.

(b) The operational certificate holder must submit all non-compliance reporting required to be submitted under this section by email to the Ministry's Compliance Reporting Submission Mailbox at EnvironmentalCompliance@gov.bc.ca or as otherwise instructed by the director. For guidelines on how to report a non-compliance or for more information visit the Ministry website http://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/data-and-report-submissions/non-compliance-reporting-mailbox.

5.4 Annual Operations and Monitoring Report

(a) The operational certificate holder must cause a Qualified Professional to certify and submit an Annual Operations and Monitoring Report in a format suitable for public release, for the preceding calendar year, to the director on or before March 31 of each year. On or before March 31 of each year, the operational certificate holder must post a copy of the Annual Operations and Monitoring Report online, on a website accessible to the public, and in accordance with any requirements of the director.

(b) The Annual Operations and Monitoring Report must include the following information:
Operations Report:
(i) Summary of OCP implementation that addresses the information in section 2.3(b), and summary of DOCP implementation that addresses the information in 2.5(b), of this operational certificate,
(ii) Summary of construction report(s),
(iii) Annual and cumulative tonnages and categories of waste including soil tonnage(s) and soil quality class(es) discharged to the Original Lined Cell and to the New Landfill,
(iv) Remaining volume and life of the Original Lined Cell and of the New Landfill,
(v) Summary of treated leachate effluent quantity and quality discharged to the treated leachate infiltration pond,
(vi) Summary of complaints and nuisances and description of remedial action planned and/or taken by the operational certificate holder to prevent similar complaints and nuisances in the future,
(vii) Summary of non-compliance notifications and non-compliance reporting and description of remedial action planned and/or taken by the operational certificate holder to prevent similar non-compliance(s) in the future ,
(viii) Annual status form in accordance with the instructions and template at the ministry website https://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/data-and-report-submissions/annual-status-form
(ix) Summary of OCP and DOCP implementation, and construction of Significant Works, planned for the next calendar year,

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Environmental Monitoring Plan Report:

(x) Site plan(s), sampling locations, stormwater flow paths, groundwater elevations, gradients and flow directions,
(xi) Sampling facilities, frequencies, substances, sampling and analytical procedures,
(xii) Data including laboratory analysis and quality assurance and quality control results,
(xiii) Data tabulation, trend analysis, graphs, diagrams, and interpretation,
(xiv) Trigger level assessment plan monitoring, data, results and interpretation,
(xv) Any determination(s) of the local background concentration of substance(s) in accordance with section 3.5 of this operational certificate,
(xvi) Comparison of the data with the standards for treated leachate effluent discharge, stormwater quality, groundwater quality, and landfill gas management, specified in sections 1.2, 1.4, 1.5, 3.5 and 3.6 of this operational certificate, and identification of any non-compliance and predicted future non-compliance,
(xvii) Results, conclusions, recommendations and changes to the environmental monitoring plan.

(c) The operational certificate holder must upload monitoring data associated with this operational certificate to the Ministry's Environmental Monitoring System (EMS) database, within 45 days of the end of the 3 month period in which the data is collected.

5.5 **Licence to Publish Documents**

(a) Subject to paragraph (b), the operational certificate holder authorizes the Province to publish on the Ministry of Environment and Climate Change Strategy website the entirety of any Regulatory Document.

(b) The Province will not publish any information that could not, if it were subject to a request under section 5 of the *Freedom of Information and Protection of Privacy Act*, be disclosed under that Act.

(c) The operational certificate holder will indemnify and save harmless the Province and the Province's employees and agents from any claim for infringement of copyright or other intellectual property rights that the Province or any of the Province's employees or agents may sustain, incur, suffer or be put to at any time that arise from the publication of a Regulatory Document.

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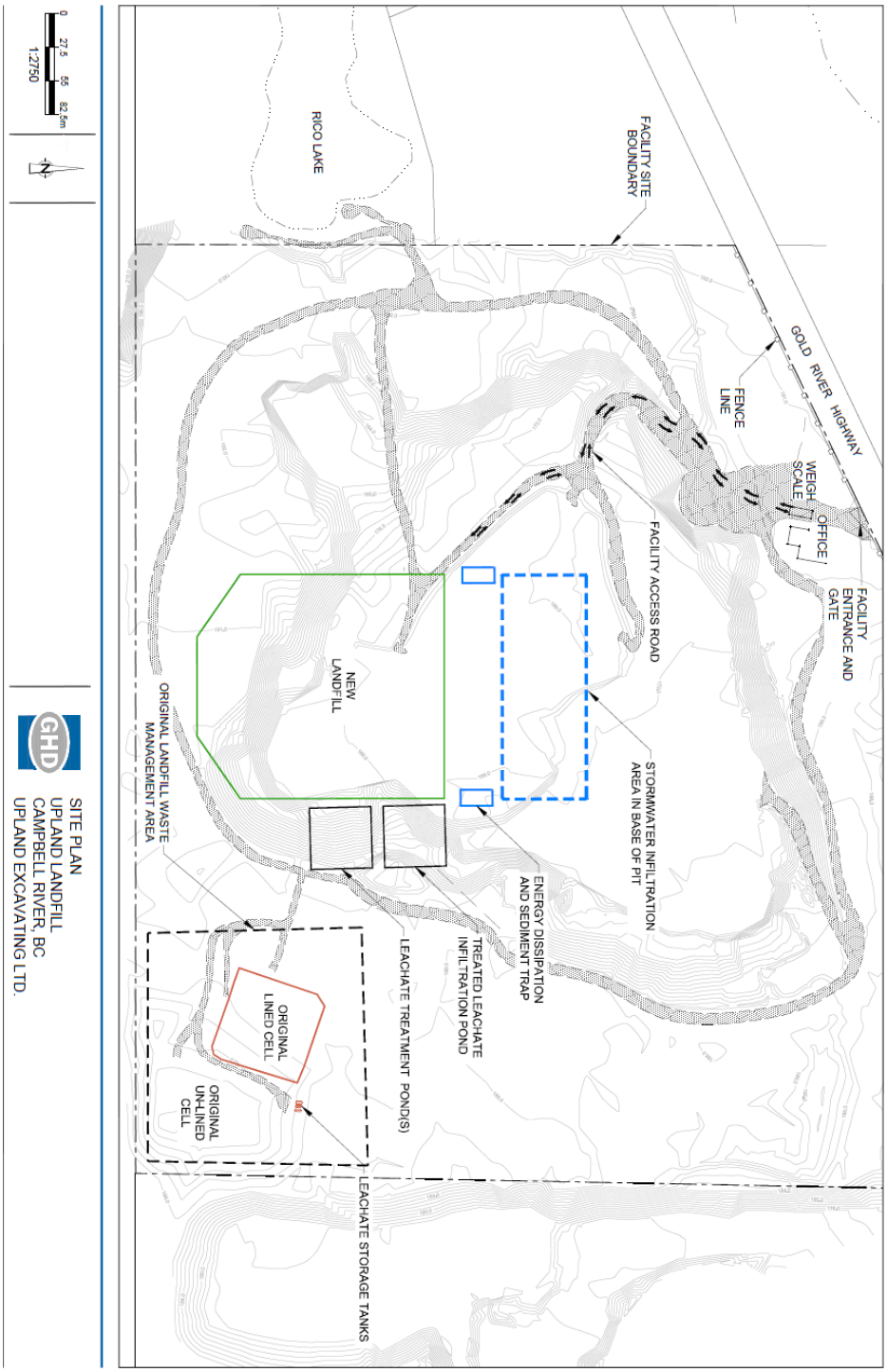
Site Plan A



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Appendix B
EMP Specification

Table 1

Schedule
Environmental Monitoring Program Specification
Original Landfill, Campbell River, BC
Upland Excavating

Sampling Location	Sampling Location Purpose	Sample Matrix	Hydraulic Monitoring	Q1/Q2	Q3/Q4
Groundwater Monitoring Program (17 locations)					
MW2-14	To characterize groundwater quality upgradient of the Original Landfill	WG	√	Schedule A	Schedule A
MW2A-16	To characterize groundwater quality upgradient of the Original Landfill	WG	√	Schedule A	Schedule A
MW3-14	To characterize groundwater quality upgradient of the Original Landfill	WG	√	Schedule A	Schedule A
MW10-17	To characterize groundwater quality cross-gradient of the Original Landfill and monitor for potential Landfill derived impacts to the underlying aquifer	WG	√	Schedule A	Schedule A
MW11-19	To characterize groundwater quality downgradient of the Original Landfill and monitor complaince with respect to water quality	WG	√	Schedule B	Schedule B
MW1-14, MW4A-15, MW4B-15, MW5A-15, MW5B-15, MW6-17, MW7-17, MW8-17, MW9-17, MW15A-18, MW15B-18, PZ1-19			√	-	-
Surface Water Monitoring Program (2 locations)					
Rico Gauge	To monitor the water level in Rico Lake via surface water gauge	-	√	-	-
McIvor Lake	To monitor the water level in McIvor Lake via BC Hydro Data Records - use link below	-	√	-	-
https://www.bchydro.com/energy-in-bc/operations/transmission-reservoir-data/previous-reservoir-					
Leak Detection Layer Monitoring Program (1 location)					
S01-17	Leak Detection Layer	W	√	Schedule B	Schedule B
Leachate Monitoring Program (1 existing location; 2 proposed locations)					
S03-19	Leachate Sump	WL	√	Schedule B	Schedule B
S04	Proposed Leachate Access Pipe	WL	-	-	-
S05	Proposed Leachate Access Pipe	WL	-	-	-
Field Quality Assurance/Quality Control					
Field Blank		WG	-	Schedule A	-
Trip Blank		W	-	-	Schedule B
Groundwater Duplicate		WG	-	Schedule A	-
Leachate Duplicate		WL	-		Schedule B
Extra Bottles					
--		WG	-	Schedule A	Schedule A
--		WL	-	Schedule B	Schedule B

Notes:

WG - Groundwater
W - Water
LW - Leachate
√ - Every monitoring event

Table 2

Analytical Parameters
Environmental Monitoring Program Specification
Original Landfill, Campbell River, BC
Upland Excavating

Groundwater (WG)	Q1/Q2	Q3/Q4
Schedule A		
Water Level Monitoring		
Top of Water	√	√
Depth to Bottom	√	-
Field Parameters		
Conductivity (field)	√	√
Oxidation reduction potential (ORP)	√	√
pH (field)	√	√
Temperature	√	√
Total dissolved solids (TDS)	√	√
Turbidity	√	√
General Chemistry		
Alkalinity (speciated)	√	√
Chloride	√	√
Conductivity	√	√
Hardness (dissolved)	√	√
Hydrogen sulfide	√	√
pH	√	√
Sulfate (dissolved)	√	√
Sulfide	√	√
Total dissolved solids (TDS)	√	√
Nutrients		
Ammonia-N	√	√
Nitrate (as N)	√	√
Nitrite (as N)	√	√
Nitrite/Nitrate	√	√
Orthophosphate	√	√
Dissolved CSR Metals (incl. sulphur, mercury, hardness)	√	√

Leak Detection Layer Water (W) & Leachate (WL)	Q1/Q2	Q3/Q4
Schedule B		
Water Level Monitoring		
Depth to Water	√	√
Depth to Bottom	√	-
Field Parameters		
Conductivity (field)	√	√
Oxidation reduction potential (ORP)	√	√
pH (field)	√	√
Temperature	√	√
Total dissolved solids (TDS)	√	√
Turbidity	√	√
General Chemistry		
Alkalinity (speciated)	√	√
Biochemical oxygen demand (BOD)	√	√
Chemical oxygen demand (COD)	√	√
Chloride (dissolved)	√	√
Conductivity	√	√
Hardness (dissolved)	√	√
Hydrogen sulfide	√	√
pH	√	√
Sulfate (dissolved)	√	√
Sulfide	√	√
Total dissolved solids (TDS)	√	√
Total suspended solids (TSS)	√	√
Nutrients		
Ammonia-N	√	√
Nitrate (as N)	√	√
Nitrite (as N)	√	√
Nitrite/Nitrate	√	√
Orthophosphate	√	√
Dissolved CSR Metals (incl. Hg, phosphorus, sulphur, hardness)	√	√
Total CSR Metals (incl. Hg, phosphorus, sulphur, hardness)	√	√
Polycyclic Aromatic Hydrocarbons	√	√
BTEX/Volatile Petroleum Hydrocarbons	√	√

Appendix C
Field Sample Keys and Laboratory Reports

GHD Field Sample Key (FSK)

Site Upland (088877)

Sample Reason Spring EMP

Sampler Name Rose Marie Rocca & Roxy Hasior

Sampling Company GHD Ltd.

Laboratory(s) Maxxam Analytics

SSOW Reference Code :

											Temperature		pH	Eh / ORP		Conductivity		Turbidity		DO		TDS	
Sample ID	Location	Sample Date (mm/dd/yyyy)	Sample Time (hh:mm)	Sample Type	Sample Matrix	Grab or Composite	Parent Sample ID for Field Dups	Footnote(s)	Volume of Water Purged (L)	Sample Temperature	Temperature Units	Field pH (s.u.)	Eh / ORP	Eh / ORP Units	Conductivity	Conductivity Units	Turbidity	Turbidity Units	Dissolved Oxygen	Dissolved Oxygen Units	Total Dissolved Solids	Total Dissolved Solids Units
W-88877-060319-RMR-01	S01-17	3/6/2019	14:30	N	W	grab		1	-	11.23	C	6.65	163	mV	727	uS/cm	3.1	ntu	-	mg/L	0.474	g/L
WG-88877-070319-RMR-02	MW10-17	3/7/2019	10:00	N	WG	grab		1	115	10.15	C	8.09	219	mV	138	uS/cm	0	ntu	-	mg/L	0.09	g/L
WG-88877-070319-RMR-03	MW2A-16	3/7/2019	11:30	N	WG	grab		1	180	11.14	C	8.48	210	mV	66	uS/cm	0.2	ntu	-	mg/L	0.042	g/L
WG-88877-070319-RMR-04	MW2A-16	3/7/2019	12:00	FD	WG	grab	WG-88877-070319-RMR-03	1	180	11.14	C	8.48	210	mV	66	uS/cm	0.2	ntu	-	mg/L	0.042	g/L
WG-88877-070319-RMR-05	MW2-14	3/7/2019	13:00	N	WG	grab		1	32	11.33	C	7.59	250	mV	220	uS/cm	24	ntu	-	mg/L	0.143	g/L
WG-88877-070319-RMR-06	MW3-14	3/7/2019	14:00	N	WG	grab		1	14	7.66	C	7.39	267	mV	114	uS/cm	57.4	ntu	-	mg/L	0.074	g/L
WG-88877-070319-RMR-08	Field Blank	3/7/2019	16:00	FB	WG	grab		1	-	-	C	-	-	mV	-	uS/cm	-	ntu	-	mg/L	-	g/L
WL-88877-070319-RMR-07	S02-17	3/7/2019	14:30	N	WL	grab		2	-	5.8	C	7.06	7	mV	618	uS/cm	78.2	ntu	-	mg/L	0.396	g/L

Footnotes

1. COC: C#578692-01-01
2. COC: C#578692-02-01

Key

- Required Field
- Populate When Appropriate
- Field Data

GHD Field Sample Key (FSK)

Site Upland (088877)

Sample Reason Spring EMP

Sampler Name David Botero

Sampling Company GHD Ltd.

Laboratory(s) Maxxam Analytics

SSOW Reference Code :

										Temperature		pH	Eh / ORP		Conductivity		Turbidity		DO		TDS	
Sample ID	Location	Sample Date (mm/dd/yyyy)	Sample Time (hh:mm)	Sample Type	Sample Matrix	Grab or Composite	Parent Sample ID for Field Dups	Footnote(s)	Volume of Water Purged (L)	Sample Temperature	Temperature Units	Field pH (s.u.)	Eh / ORP	Eh / ORP Units	Conductivity	Conductivity Units	Turbidity	Turbidity Units	Dissolved Oxygen	Dissolved Oxygen Units	Total Dissolved Solids	Total Dissolved Solids Units
WG-88877-070519-DB-01	MW11-19	5/7/2019	17:00	N	WG	grab		1	40	16.59	C	7.33	184	mV	151	uS/cm	597	ntu	-	mg/L	0.098	g/L

Footnotes

1. COC: 15-88877-070519
2.
3.
4.
5.
6.

Key

- Required Field
- Populate When Appropriate
- Field Data

GHD Field Sample Key (FSK)

Site Uplands (088877-07-02)

Sample Reason Fall EMP

Sampler Name Rimi Plaha

Sampling Company GHD Ltd.

Laboratory(s) Bureau Veritas

SSOW Reference Code :

Sample ID	Location	Sample Date (mm/dd/yyyy)	Sample Time (hh:mm)	Sample Type	Sample Matrix	Grab or Composite	Parent Sample ID for Field Dups	Footnote(s)	Volume of Water Purged (L)	Temperature		pH	Eh / ORP		Conductivity		Turbidity		DO		TDS	
										Sample Temperature	Temperature Units	Field pH (s.u.)	Eh / ORP	Eh / ORP Units	Conductivity	Conductivity Units	Turbidity	Turbidity Units	Dissolved Oxygen	Dissolved Oxygen Units	Total Dissolved Solids	Total Dissolved Solids Units
WG-088877-300919-RP-01	MW11-19	9/30/2019	14:20	N	WG	grab		1	30	14.11	deg C	7.49	161	mV	440	uS/cm	OOR	ntu	-	-	0.276	g/L
WG-088877-300919-RP-02	MW10-17	9/30/2019	16:00	N	WG	grab		1	32	11.52	deg C	8.11	171	mV	133	uS/cm	16.0	ntu	-	-	0.087	g/L
WG-088877-300919-RP-03	MW10-17	9/30/2019	16:05	FD	WQ	grab	WG-088877-300919-RP-02	2	32	11.52	deg C	8.11	171	mV	133	uS/cm	16.0	ntu	-	-	0.087	g/L
-	MW2-14	-	-	-	-	-		4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	MW2A-16	-	-	-	-	-		4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	MW3-14	-	-	-	-	-		4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WL-088877-300919-RP-04	Trip Blank	9/30/2019	16:05	TB	WQ	-		3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WL-088877-021019-RP-13	S01-17	10/2/2019	12:20	N	WG	grab		3	-	12.75	deg C	6.73	-50	mV	419	uS/cm	85.2	ntu	-	-	0.299	g/L
WL-088877-021019-RP-14	S03-19	10/2/2019	13:15	N	WG	grab		3	-	12.02	deg C	7.12	42	mV	377	uS/cm	12.6	ntu	-	-	0.245	g/L
WL-088877-021019-RP-15	S03-19	10/2/2019	13:20	FD	WQ	grab	WL-088877-021019-RP-14	3	-	12.02	deg C	7.12	42	mV	377	uS/cm	12.6	ntu	-	-	0.245	g/L

Footnotes

1. COC#591106-01-01
2. Sample on hold
3. COC#G132876
4. Dry well.

Key

- Required Field
- Populate When Appropriate
- Field Data

Your P.O. #: 73506780
Your Project #: 88877-07-02
Site#: 88877-07-02
Your C.O.C. #: 578692-02-01

Attention: Airesse MacPhee

GHD Limited
651 COLBY DRIVE
WATERLOO, ON
CANADA N2V 1C2

Report Date: 2019/03/18
Report #: R2698852
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B917080
Received: 2019/03/08, 15:50

Sample Matrix: GROUND WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity - Water	1	N/A	2019/03/11	BBY6SOP-00026	SM 22 2320 B m
Biochemical Oxygen Demand	1	2019/03/09	2019/03/14	BBY6SOP-00045	SM 23 5210 B m
BTEX/MTBE LH, VH, F1 SIM/MS	1	N/A	2019/03/12	BBY8SOP-00010/11/12	BCMOE BCLM Jul 2017
Chloride by Automated Colourimetry	1	N/A	2019/03/12	BBY6SOP-00011	SM 22 4500-Cl- E m
COD by Colorimeter	1	N/A	2019/03/12	BBY6SOP-00024	SM 22 5220 D m
Conductance - water	1	N/A	2019/03/11	BBY6SOP-00026	SM 22 2510 B m
Sulphide (as H2S) (1)	1	N/A	2019/03/12	AB WI-00065	Auto Calc
Hardness Total (calculated as CaCO3) (2)	1	N/A	2019/03/11	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	1	N/A	2019/03/12	BBY WI-00033	Auto Calc
Mercury (Dissolved) by CVAF	1	N/A	2019/03/09	BBY7SOP-00015	BCMOE BCLM Oct2013 m
Mercury (Total) by CVAF	1	2019/03/09	2019/03/09	BBY7SOP-00015	BCMOE BCLM Oct2013 m
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	1	N/A	2019/03/12	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	1	N/A	2019/03/11	BBY7SOP-00002	EPA 6020b R2 m
Na, K, Ca, Mg, S by CRC ICPMS (total)	1	2019/03/08	2019/03/11	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (total)	1	2019/03/09	2019/03/10	BBY7SOP-00003 BBY7SOP-00002	EPA 6020b R2 m
Ammonia-N (Total) (1)	1	N/A	2019/03/13	AB SOP-00007	SM 23 4500 NH3 A G m
Nitrate + Nitrite (N) (highlevel)	1	N/A	2019/03/09	BBY6SOP-00010	SM 23 4500-NO3- I m
Nitrite (N) by CFA (highlevel)	1	N/A	2019/03/09	BBY6SOP-00010	SM 23 4500-NO3- I m
Nitrogen - Nitrate (as N)	1	N/A	2019/03/09	BBY WI-00033	Auto Calc
PAH in Water by GC/MS (SIM)	1	2019/03/12	2019/03/14	BBY8SOP-00021	BCMOE BCLM Jul2017m
Total LMW, HMW, Total PAH Calc (3)	1	N/A	2019/03/14	BBY WI-00033	Auto Calc
Filter and HNO3 Preserve for Metals	1	N/A	2019/03/08	BBY7 WI-00004	SM 23 3030B m
pH Water (4)	1	N/A	2019/03/11	BBY6SOP-00026	SM 22 4500-H+ B m
Total Sulphide (1)	1	N/A	2019/03/12	AB SOP-00080	SM 23 4500 S2-A D Fm
Sulphate by Automated Colourimetry	1	N/A	2019/03/12	BBY6SOP-00017	SM 22 4500-SO42- E m
Total Dissolved Solids (Filt. Residue)	1	2019/03/13	2019/03/14	BBY6SOP-00033	SM 23 2540 C m
Total Suspended Solids	1	2019/03/13	2019/03/13	BBY6SOP-00034	SM 23 2540 D
Volatile HC-BTEX (5)	1	N/A	2019/03/13	BBY WI-00033	Auto Calc

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted,

Your P.O. #: 73506780
Your Project #: 88877-07-02
Site#: 88877-07-02
Your C.O.C. #: 578692-02-01

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651 COLBY DRIVE
WATERLOO, ON
CANADA N2V 1C2

Report Date: 2019/03/18
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CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B917080
Received: 2019/03/08, 15:50

procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam Calgary Environmental
(2) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).
(3) Total PAHs in Water include: Quinoline, Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Acridine, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b&j)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, and Benzo(g,h,i)perylene.
(4) The BC-MOE and APHA Standard Method require pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the BC-MOE/APHA Standard Method holding time.
(5) VPH = VH - (Benzene + Toluene + Ethylbenzene + m & p-Xylene + o-Xylene + Styrene)

Encryption Key

Parminder Virk
Project Manager
18 Mar 2019 16:13:39

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Parminder Virk, Project Manager
Email: PVirk@maxxam.ca
Phone# (403)735-2235

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This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B917080
Report Date: 2019/03/18

GHD Limited
Client Project #: 88877-07-02
Your P.O. #: 73506780
Sampler Initials: RR

RESULTS OF CHEMICAL ANALYSES OF GROUND WATER

Maxxam ID		VI4138		
Sampling Date		2019/03/07 14:30		
COC Number		578692-02-01		
	UNITS	WL88877-070319-RWR-07	RDL	QC Batch
ANIONS				
Nitrite (N)	mg/L	<0.10	0.10	9345088
Calculated Parameters				
Filter and HNO3 Preservation	N/A	FIELD	N/A	ONSITE
Nitrate (N)	mg/L	<0.10	0.10	9344089
Sulphide (as H2S)	mg/L	0.032	0.0020	9343489
Demand Parameters				
Biochemical Oxygen Demand	mg/L	41.0	6.0	9345035
Chemical Oxygen Demand	mg/L	144	10	9343178
Misc. Inorganics				
Alkalinity (Total as CaCO3)	mg/L	406	1.0	9346458
Alkalinity (PP as CaCO3)	mg/L	<1.0	1.0	9346458
Bicarbonate (HCO3)	mg/L	496	1.0	9346458
Carbonate (CO3)	mg/L	<1.0	1.0	9346458
Hydroxide (OH)	mg/L	<1.0	1.0	9346458
Anions				
Dissolved Sulphate (SO4)	mg/L	6.6	1.0	9348331
Total Sulphide	mg/L	0.030 (1)	0.0019	9346763
Dissolved Chloride (Cl)	mg/L	16	1.0	9348330
Nutrients				
Total Ammonia (N)	mg/L	0.57	0.015	9348091
Nitrate plus Nitrite (N)	mg/L	<0.10	0.10	9345087
Physical Properties				
Conductivity	uS/cm	790	2.0	9346457
pH	pH	7.77	N/A	9346453
Physical Properties				
Total Suspended Solids	mg/L	55.2 (2)	8.0	9348158
Total Dissolved Solids	mg/L	504	10	9348253

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Sample pH <9, preservation incomplete. Due to volatility of analyte, a low bias in the results is likely.
(2) RDL raised due to limited initial sample amount.

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Maxxam Job #: B917080
Report Date: 2019/03/18

GHD Limited
Client Project #: 88877-07-02
Your P.O. #: 73506780
Sampler Initials: RR

CSR BTEX/VPH IN WATER (GROUND WATER)

Maxxam ID		VI4138		
Sampling Date		2019/03/07 14:30		
COC Number		578692-02-01		
	UNITS	WL88877-070319-RWR-07	RDL	QC Batch
Calculated Parameters				
VPH (VHW6 to 10 - BTEX)	ug/L	<300	300	9344101
Volatiles				
Methyl-tert-butylether (MTBE)	ug/L	<4.0	4.0	9345947
Benzene	ug/L	1.1	0.40	9345947
Toluene	ug/L	21	0.40	9345947
Ethylbenzene	ug/L	2.3	0.40	9345947
m & p-Xylene	ug/L	2.5	0.40	9345947
o-Xylene	ug/L	2.0	0.40	9345947
Styrene	ug/L	<0.40	0.40	9345947
Xylenes (Total)	ug/L	4.6	0.40	9345947
VH C6-C10	ug/L	<300	300	9345947
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	96	N/A	9345947
4-Bromofluorobenzene (sur.)	%	106	N/A	9345947
D4-1,2-Dichloroethane (sur.)	%	94	N/A	9345947

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B917080
Report Date: 2019/03/18

GHD Limited
Client Project #: 88877-07-02
Your P.O. #: 73506780
Sampler Initials: RR

CSR/CCME DISS. METALS IN WATER W/ CV HG (GROUND WATER)

Maxxam ID		VI4138		
Sampling Date		2019/03/07 14:30		
COC Number		578692-02-01		
	UNITS	WL88877-070319-RWR-07	RDL	QC Batch
Calculated Parameters				
Dissolved Hardness (CaCO3)	mg/L	349	0.50	9343549
Elements				
Dissolved Mercury (Hg)	ug/L	<0.0020	0.0020	9345094
Dissolved Metals by ICPMS				
Dissolved Aluminum (Al)	ug/L	17.4	3.0	9345859
Dissolved Antimony (Sb)	ug/L	<0.50	0.50	9345859
Dissolved Arsenic (As)	ug/L	1.82	0.10	9345859
Dissolved Barium (Ba)	ug/L	16.1	1.0	9345859
Dissolved Beryllium (Be)	ug/L	<0.10	0.10	9345859
Dissolved Bismuth (Bi)	ug/L	<1.0	1.0	9345859
Dissolved Boron (B)	ug/L	57	50	9345859
Dissolved Cadmium (Cd)	ug/L	0.015	0.010	9345859
Dissolved Chromium (Cr)	ug/L	1.2	1.0	9345859
Dissolved Cobalt (Co)	ug/L	2.35	0.20	9345859
Dissolved Copper (Cu)	ug/L	0.86	0.20	9345859
Dissolved Iron (Fe)	ug/L	6970	5.0	9345859
Dissolved Lead (Pb)	ug/L	<0.20	0.20	9345859
Dissolved Lithium (Li)	ug/L	<2.0	2.0	9345859
Dissolved Manganese (Mn)	ug/L	3860	1.0	9345859
Dissolved Molybdenum (Mo)	ug/L	<1.0	1.0	9345859
Dissolved Nickel (Ni)	ug/L	1.2	1.0	9345859
Dissolved Selenium (Se)	ug/L	0.22	0.10	9345859
Dissolved Silicon (Si)	ug/L	9410	100	9345859
Dissolved Silver (Ag)	ug/L	<0.020	0.020	9345859
Dissolved Strontium (Sr)	ug/L	313	1.0	9345859
Dissolved Thallium (Tl)	ug/L	<0.010	0.010	9345859
Dissolved Tin (Sn)	ug/L	<5.0	5.0	9345859
Dissolved Titanium (Ti)	ug/L	<5.0	5.0	9345859
Dissolved Uranium (U)	ug/L	0.30	0.10	9345859
Dissolved Vanadium (V)	ug/L	<5.0	5.0	9345859
Dissolved Zinc (Zn)	ug/L	10.7	5.0	9345859
Dissolved Zirconium (Zr)	ug/L	0.55	0.10	9345859
RDL = Reportable Detection Limit				

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Maxxam Job #: B917080
Report Date: 2019/03/18

GHD Limited
Client Project #: 88877-07-02
Your P.O. #: 73506780
Sampler Initials: RR

CSR/CCME DISS. METALS IN WATER W/ CV HG (GROUND WATER)

Maxxam ID		VI4138		
Sampling Date		2019/03/07 14:30		
COC Number		578692-02-01		
	UNITS	WL88877-070319-RWR-07	RDL	QC Batch
Dissolved Calcium (Ca)	mg/L	113	0.050	9344080
Dissolved Magnesium (Mg)	mg/L	16.1	0.050	9344080
Dissolved Potassium (K)	mg/L	2.48	0.050	9344080
Dissolved Sodium (Na)	mg/L	27.2	0.050	9344080
Dissolved Sulphur (S)	mg/L	<3.0	3.0	9344080
RDL = Reportable Detection Limit				

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Maxxam Job #: B917080
Report Date: 2019/03/18

GHD Limited
Client Project #: 88877-07-02
Your P.O. #: 73506780
Sampler Initials: RR

CSR/CCME TOT. METALS IN WATER W/ CV HG (GROUND WATER)

Maxxam ID		VI4138		
Sampling Date		2019/03/07 14:30		
COC Number		578692-02-01		
	UNITS	WL88877-070319-RWR-07	RDL	QC Batch
Calculated Parameters				
Total Hardness (CaCO3)	mg/L	323	0.50	9343548
Elements				
Total Mercury (Hg)	ug/L	<0.0020	0.0020	9345057
Total Metals by ICPMS				
Total Aluminum (Al)	ug/L	1650	3.0	9344930
Total Antimony (Sb)	ug/L	<0.50	0.50	9344930
Total Arsenic (As)	ug/L	3.01	0.10	9344930
Total Barium (Ba)	ug/L	21.8	1.0	9344930
Total Beryllium (Be)	ug/L	<0.10	0.10	9344930
Total Bismuth (Bi)	ug/L	<1.0	1.0	9344930
Total Boron (B)	ug/L	63	50	9344930
Total Cadmium (Cd)	ug/L	0.095	0.010	9344930
Total Chromium (Cr)	ug/L	3.0	1.0	9344930
Total Cobalt (Co)	ug/L	3.24	0.20	9344930
Total Copper (Cu)	ug/L	14.4	0.50	9344930
Total Iron (Fe)	ug/L	10300	10	9344930
Total Lead (Pb)	ug/L	0.46	0.20	9344930
Total Lithium (Li)	ug/L	<2.0	2.0	9344930
Total Manganese (Mn)	ug/L	3680	1.0	9344930
Total Molybdenum (Mo)	ug/L	<1.0	1.0	9344930
Total Nickel (Ni)	ug/L	2.6	1.0	9344930
Total Selenium (Se)	ug/L	0.22	0.10	9344930
Total Silicon (Si)	ug/L	11000	100	9344930
Total Silver (Ag)	ug/L	<0.020	0.020	9344930
Total Strontium (Sr)	ug/L	324	1.0	9344930
Total Thallium (Tl)	ug/L	<0.010	0.010	9344930
Total Tin (Sn)	ug/L	<5.0	5.0	9344930
Total Titanium (Ti)	ug/L	109	5.0	9344930
Total Uranium (U)	ug/L	0.31	0.10	9344930
Total Vanadium (V)	ug/L	9.2	5.0	9344930
Total Zinc (Zn)	ug/L	62.2	5.0	9344930
Total Zirconium (Zr)	ug/L	0.89	0.10	9344930
RDL = Reportable Detection Limit				

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Maxxam Job #: B917080
Report Date: 2019/03/18

GHD Limited
Client Project #: 88877-07-02
Your P.O. #: 73506780
Sampler Initials: RR

CSR/CCME TOT. METALS IN WATER W/ CV HG (GROUND WATER)

Maxxam ID		VI4138		
Sampling Date		2019/03/07 14:30		
COC Number		578692-02-01		
	UNITS	WL88877-070319-RWR-07	RDL	QC Batch
Total Calcium (Ca)	mg/L	103	0.050	9344087
Total Magnesium (Mg)	mg/L	15.8	0.050	9344087
Total Potassium (K)	mg/L	2.46	0.050	9344087
Total Sodium (Na)	mg/L	25.1	0.050	9344087
Total Sulphur (S)	mg/L	<3.0	3.0	9344087
RDL = Reportable Detection Limit				

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Maxxam Job #: B917080
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GHD Limited
Client Project #: 88877-07-02
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Sampler Initials: RR

CSR PAH IN WATER BY GC-MS (GROUND WATER)

Maxxam ID		VI4138		
Sampling Date		2019/03/07 14:30		
COC Number		578692-02-01		
	UNITS	WL88877-070319-RWR-07	RDL	QC Batch
Calculated Parameters				
Low Molecular Weight PAH`s	ug/L	1200	5.0	9344093
High Molecular Weight PAH`s	ug/L	28	0.10	9344093
Total PAH	ug/L	1300	5.0	9344093
Polycyclic Aromatics				
Quinoline	ug/L	1.2	0.020	9346822
Naphthalene	ug/L	900 (1)	5.0	9346822
1-Methylnaphthalene	ug/L	74 (1)	0.25	9346822
2-Methylnaphthalene	ug/L	100 (1)	0.50	9346822
Acenaphthylene	ug/L	1.3	0.050	9346822
Acenaphthene	ug/L	70 (1)	0.25	9346822
Fluorene	ug/L	28 (1)	0.25	9346822
Phenanthrene	ug/L	40 (1)	0.25	9346822
Anthracene	ug/L	6.1	0.010	9346822
Acridine	ug/L	4.7	0.050	9346822
Fluoranthene	ug/L	11 (1)	0.10	9346822
Pyrene	ug/L	8.8	0.020	9346822
Benzo(a)anthracene	ug/L	2.1	0.010	9346822
Chrysene	ug/L	2.7	0.020	9346822
Benzo(b&j)fluoranthene	ug/L	1.6	0.030	9346822
Benzo(k)fluoranthene	ug/L	0.63	0.050	9346822
Benzo(a)pyrene	ug/L	1.2	0.0050	9346822
Indeno(1,2,3-cd)pyrene	ug/L	0.32	0.050	9346822
Dibenz(a,h)anthracene	ug/L	0.11	0.0030	9346822
Benzo(g,h,i)perylene	ug/L	0.36	0.050	9346822
Surrogate Recovery (%)				
D10-ANTHRACENE (sur.)	%	80	N/A	9346822
D8-ACENAPHTHYLENE (sur.)	%	99	N/A	9346822
D8-NAPHTHALENE (sur.)	%	58	N/A	9346822
TERPHENYL-D14 (sur.)	%	87	N/A	9346822

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

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Maxxam Job #: B917080
Report Date: 2019/03/18

GHD Limited
Client Project #: 88877-07-02
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GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B917080
Report Date: 2019/03/18

QUALITY ASSURANCE REPORT

GHD Limited
Client Project #: 88877-07-02
Your P.O. #: 73506780
Sampler Initials: RR

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9345947	1,4-Difluorobenzene (sur.)	2019/03/12	94	70 - 130	97	70 - 130	98	%		
9345947	4-Bromofluorobenzene (sur.)	2019/03/12	102	70 - 130	100	70 - 130	107	%		
9345947	D4-1,2-Dichloroethane (sur.)	2019/03/12	101	70 - 130	98	70 - 130	108	%		
9346822	D10-ANTHRACENE (sur.)	2019/03/12	90	50 - 140	93	50 - 140	94	%		
9346822	D8-ACENAPHTHYLENE (sur.)	2019/03/12	92	50 - 140	91	50 - 140	94	%		
9346822	D8-NAPHTHALENE (sur.)	2019/03/12	77	50 - 140	77	50 - 140	81	%		
9346822	TERPHENYL-D14 (sur.)	2019/03/12	89	50 - 140	89	50 - 140	88	%		
9343178	Chemical Oxygen Demand	2019/03/12	97	80 - 120	96	80 - 120	<10	mg/L	11 (1)	20
9344930	Total Aluminum (Al)	2019/03/10	100	80 - 120	98	80 - 120	<3.0	ug/L	5.9 (1)	20
9344930	Total Antimony (Sb)	2019/03/10	99	80 - 120	96	80 - 120	<0.50	ug/L	NC (1)	20
9344930	Total Arsenic (As)	2019/03/10	104	80 - 120	98	80 - 120	<0.10	ug/L	5.7 (1)	20
9344930	Total Barium (Ba)	2019/03/10	96	80 - 120	99	80 - 120	<1.0	ug/L	3.6 (1)	20
9344930	Total Beryllium (Be)	2019/03/10	94	80 - 120	96	80 - 120	<0.10	ug/L	NC (1)	20
9344930	Total Bismuth (Bi)	2019/03/10	93	80 - 120	95	80 - 120	<1.0	ug/L	NC (1)	20
9344930	Total Boron (B)	2019/03/10	NC	80 - 120	98	80 - 120	<50	ug/L	0.49 (1)	20
9344930	Total Cadmium (Cd)	2019/03/10	95	80 - 120	96	80 - 120	<0.010	ug/L	NC (1)	20
9344930	Total Chromium (Cr)	2019/03/10	93	80 - 120	97	80 - 120	<1.0	ug/L	NC (1)	20
9344930	Total Cobalt (Co)	2019/03/10	91	80 - 120	97	80 - 120	<0.20	ug/L	NC (1)	20
9344930	Total Copper (Cu)	2019/03/10	85	80 - 120	96	80 - 120	<0.50	ug/L	5.4 (1)	20
9344930	Total Iron (Fe)	2019/03/10	95	80 - 120	99	80 - 120	<10	ug/L	5.2 (1)	20
9344930	Total Lead (Pb)	2019/03/10	95	80 - 120	97	80 - 120	<0.20	ug/L	3.1 (1)	20
9344930	Total Lithium (Li)	2019/03/10	92	80 - 120	94	80 - 120	<2.0	ug/L		
9344930	Total Manganese (Mn)	2019/03/10	95	80 - 120	98	80 - 120	<1.0	ug/L	2.0 (1)	20
9344930	Total Molybdenum (Mo)	2019/03/10	104	80 - 120	97	80 - 120	<1.0	ug/L	NC (1)	20
9344930	Total Nickel (Ni)	2019/03/10	89	80 - 120	97	80 - 120	<1.0	ug/L	NC (1)	20
9344930	Total Selenium (Se)	2019/03/10	98	80 - 120	96	80 - 120	<0.10	ug/L	NC (1)	20
9344930	Total Silicon (Si)	2019/03/10	98	80 - 120	100	80 - 120	<100	ug/L	0.54 (1)	20
9344930	Total Silver (Ag)	2019/03/10	94	80 - 120	95	80 - 120	<0.020	ug/L	NC (1)	20
9344930	Total Strontium (Sr)	2019/03/10	NC	80 - 120	97	80 - 120	<1.0	ug/L	1.7 (1)	20
9344930	Total Thallium (Tl)	2019/03/10	95	80 - 120	95	80 - 120	<0.010	ug/L	NC (1)	20
9344930	Total Tin (Sn)	2019/03/10	101	80 - 120	97	80 - 120	<5.0	ug/L	NC (1)	20

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B917080
Report Date: 2019/03/18

QUALITY ASSURANCE REPORT(CONT'D)

GHD Limited
Client Project #: 88877-07-02
Your P.O. #: 73506780
Sampler Initials: RR

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9344930	Total Titanium (Ti)	2019/03/10	98	80 - 120	99	80 - 120	<5.0	ug/L	NC (1)	20
9344930	Total Uranium (U)	2019/03/10	99	80 - 120	96	80 - 120	<0.10	ug/L	NC (1)	20
9344930	Total Vanadium (V)	2019/03/10	97	80 - 120	97	80 - 120	<5.0	ug/L	NC (1)	20
9344930	Total Zinc (Zn)	2019/03/10	91	80 - 120	98	80 - 120	<5.0	ug/L	3.5 (1)	20
9344930	Total Zirconium (Zr)	2019/03/10	107	80 - 120	97	80 - 120	<0.10	ug/L	NC (1)	20
9345035	Biochemical Oxygen Demand	2019/03/14			98	85 - 115	<6.0	mg/L		
9345057	Total Mercury (Hg)	2019/03/09	86	80 - 120	94	80 - 120	<0.0020	ug/L	NC (1)	20
9345087	Nitrate plus Nitrite (N)	2019/03/09			109	80 - 120	<0.10	mg/L		
9345088	Nitrite (N)	2019/03/09			101	80 - 120	<0.10	mg/L		
9345094	Dissolved Mercury (Hg)	2019/03/09	103	80 - 120	95	80 - 120	<0.0020	ug/L	NC (1)	20
9345859	Dissolved Aluminum (Al)	2019/03/11	98	80 - 120	99	80 - 120	<3.0	ug/L	12 (1)	20
9345859	Dissolved Antimony (Sb)	2019/03/11	99	80 - 120	97	80 - 120	<0.50	ug/L	NC (1)	20
9345859	Dissolved Arsenic (As)	2019/03/11	101	80 - 120	100	80 - 120	<0.10	ug/L	3.3 (1)	20
9345859	Dissolved Barium (Ba)	2019/03/11	NC	80 - 120	99	80 - 120	<1.0	ug/L	5.2 (1)	20
9345859	Dissolved Beryllium (Be)	2019/03/11	95	80 - 120	97	80 - 120	<0.10	ug/L	NC (1)	20
9345859	Dissolved Bismuth (Bi)	2019/03/11	93	80 - 120	102	80 - 120	<1.0	ug/L	NC (1)	20
9345859	Dissolved Boron (B)	2019/03/11	99	80 - 120	101	80 - 120	<50	ug/L	6.7 (1)	20
9345859	Dissolved Cadmium (Cd)	2019/03/11	96	80 - 120	100	80 - 120	<0.010	ug/L	3.0 (1)	20
9345859	Dissolved Chromium (Cr)	2019/03/11	93	80 - 120	98	80 - 120	<1.0	ug/L	0.82 (1)	20
9345859	Dissolved Cobalt (Co)	2019/03/11	90	80 - 120	98	80 - 120	<0.20	ug/L	6.3 (1)	20
9345859	Dissolved Copper (Cu)	2019/03/11	84	80 - 120	95	80 - 120	<0.20	ug/L	0.11 (1)	20
9345859	Dissolved Iron (Fe)	2019/03/11	94	80 - 120	98	80 - 120	<5.0	ug/L	3.0 (1)	20
9345859	Dissolved Lead (Pb)	2019/03/11	93	80 - 120	101	80 - 120	<0.20	ug/L	NC (1)	20
9345859	Dissolved Lithium (Li)	2019/03/11	96	80 - 120	103	80 - 120	<2.0	ug/L	3.6 (1)	20
9345859	Dissolved Manganese (Mn)	2019/03/11	NC	80 - 120	100	80 - 120	<1.0	ug/L	2.5 (1)	20
9345859	Dissolved Molybdenum (Mo)	2019/03/11	NC	80 - 120	103	80 - 120	<1.0	ug/L	3.0 (1)	20
9345859	Dissolved Nickel (Ni)	2019/03/11	86	80 - 120	96	80 - 120	<1.0	ug/L	1.7 (1)	20
9345859	Dissolved Selenium (Se)	2019/03/11	99	80 - 120	98	80 - 120	<0.10	ug/L	0.76 (1)	20
9345859	Dissolved Silicon (Si)	2019/03/11	NC	80 - 120	99	80 - 120	<100	ug/L	1.6 (1)	20
9345859	Dissolved Silver (Ag)	2019/03/11	95	80 - 120	101	80 - 120	<0.020	ug/L	NC (1)	20
9345859	Dissolved Strontium (Sr)	2019/03/11	NC	80 - 120	99	80 - 120	<1.0	ug/L	2.7 (1)	20

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Maxxam Job #: B917080
Report Date: 2019/03/18

QUALITY ASSURANCE REPORT(CONT'D)

GHD Limited
Client Project #: 88877-07-02
Your P.O. #: 73506780
Sampler Initials: RR

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9345859	Dissolved Thallium (Tl)	2019/03/11	97	80 - 120	102	80 - 120	<0.010	ug/L	1.6 (1)	20
9345859	Dissolved Tin (Sn)	2019/03/11	99	80 - 120	97	80 - 120	<5.0	ug/L	NC (1)	20
9345859	Dissolved Titanium (Ti)	2019/03/11	96	80 - 120	98	80 - 120	<5.0	ug/L	NC (1)	20
9345859	Dissolved Uranium (U)	2019/03/11	104	80 - 120	105	80 - 120	<0.10	ug/L	1.3 (1)	20
9345859	Dissolved Vanadium (V)	2019/03/11	95	80 - 120	98	80 - 120	<5.0	ug/L	NC (1)	20
9345859	Dissolved Zinc (Zn)	2019/03/11	96	80 - 120	98	80 - 120	<5.0	ug/L	NC (1)	20
9345859	Dissolved Zirconium (Zr)	2019/03/11	103	80 - 120	100	80 - 120	<0.10	ug/L	7.3 (1)	20
9345947	Benzene	2019/03/12	101	70 - 130	103	70 - 130	<0.40	ug/L	NC (1)	30
9345947	Ethylbenzene	2019/03/12	113	70 - 130	108	70 - 130	<0.40	ug/L	NC (1)	30
9345947	m & p-Xylene	2019/03/12	106	70 - 130	112	70 - 130	<0.40	ug/L	NC (1)	30
9345947	Methyl-tert-butylether (MTBE)	2019/03/12	108	70 - 130	104	70 - 130	<4.0	ug/L	NC (1)	30
9345947	o-Xylene	2019/03/12	110	70 - 130	106	70 - 130	<0.40	ug/L	NC (1)	30
9345947	Styrene	2019/03/12	106	70 - 130	101	70 - 130	<0.40	ug/L	NC (1)	30
9345947	Toluene	2019/03/12	106	70 - 130	102	70 - 130	<0.40	ug/L	1.8 (1)	30
9345947	VH C6-C10	2019/03/12			94	70 - 130	<300	ug/L	NC (1)	30
9345947	Xylenes (Total)	2019/03/12					<0.40	ug/L	NC (1)	30
9346453	pH	2019/03/12			101	97 - 103			0.22 (1)	20
9346457	Conductivity	2019/03/11			101	80 - 120	<2.0	uS/cm		
9346458	Alkalinity (PP as CaCO3)	2019/03/11					<1.0	mg/L		
9346458	Alkalinity (Total as CaCO3)	2019/03/11	NC	80 - 120	92	80 - 120	<1.0	mg/L		
9346458	Bicarbonate (HCO3)	2019/03/11					<1.0	mg/L		
9346458	Carbonate (CO3)	2019/03/11					<1.0	mg/L		
9346458	Hydroxide (OH)	2019/03/11					<1.0	mg/L		
9346763	Total Sulphide	2019/03/12			96	80 - 120	<0.0019	mg/L	1.2 (1)	20
9346822	1-Methylnaphthalene	2019/03/12	97	50 - 140	86	50 - 140	<0.050	ug/L		
9346822	2-Methylnaphthalene	2019/03/12	91	50 - 140	81	50 - 140	<0.10	ug/L	NC (1)	40
9346822	Acenaphthene	2019/03/12	97	50 - 140	89	50 - 140	<0.050	ug/L	4.9 (1)	40
9346822	Acenaphthylene	2019/03/12	98	50 - 140	89	50 - 140	<0.050	ug/L	NC (1)	40
9346822	Acridine	2019/03/12	108	50 - 140	102	50 - 140	<0.050	ug/L	NC (1)	40
9346822	Anthracene	2019/03/12	103	50 - 140	95	50 - 140	<0.010	ug/L	NC (1)	40
9346822	Benzo(a)anthracene	2019/03/12	109	50 - 140	100	50 - 140	<0.010	ug/L	NC (1)	40

Maxxam Job #: B917080
Report Date: 2019/03/18

QUALITY ASSURANCE REPORT(CONT'D)

GHD Limited
Client Project #: 88877-07-02
Your P.O. #: 73506780
Sampler Initials: RR

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9346822	Benzo(a)pyrene	2019/03/12	107	50 - 140	97	50 - 140	<0.0050	ug/L	NC (1)	40
9346822	Benzo(b&j)fluoranthene	2019/03/12	108	50 - 140	97	50 - 140	<0.030	ug/L	NC (1)	40
9346822	Benzo(g,h,i)perylene	2019/03/12	108	50 - 140	103	50 - 140	<0.050	ug/L	NC (1)	40
9346822	Benzo(k)fluoranthene	2019/03/12	107	50 - 140	104	50 - 140	<0.050	ug/L	NC (1)	40
9346822	Chrysene	2019/03/12	105	50 - 140	96	50 - 140	<0.020	ug/L	NC (1)	40
9346822	Dibenz(a,h)anthracene	2019/03/12	103	50 - 140	98	50 - 140	<0.0030	ug/L	NC (1)	40
9346822	Fluoranthene	2019/03/12	102	50 - 140	95	50 - 140	<0.020	ug/L	NC (1)	40
9346822	Fluorene	2019/03/12	104	50 - 140	93	50 - 140	<0.050	ug/L	NC (1)	40
9346822	Indeno(1,2,3-cd)pyrene	2019/03/12	102	50 - 140	98	50 - 140	<0.050	ug/L	NC (1)	40
9346822	Naphthalene	2019/03/12	84	50 - 140	77	50 - 140	<0.10	ug/L	NC (1)	40
9346822	Phenanthrene	2019/03/12	96	50 - 140	89	50 - 140	<0.050	ug/L	NC (1)	40
9346822	Pyrene	2019/03/12	98	50 - 140	92	50 - 140	<0.020	ug/L	NC (1)	40
9346822	Quinoline	2019/03/12	111	50 - 140	104	50 - 140	<0.020	ug/L	NC (1)	40
9348091	Total Ammonia (N)	2019/03/13	NC	80 - 120	108	80 - 120	<0.015	mg/L	0.59 (1)	20
9348158	Total Suspended Solids	2019/03/13	97	80 - 120	102	80 - 120	<4.0	mg/L	0 (1)	20
9348253	Total Dissolved Solids	2019/03/14	105 (2)	80 - 120	99	80 - 120	<10	mg/L	0.18 (1)	20
9348330	Dissolved Chloride (Cl)	2019/03/12	81	80 - 120	101	80 - 120	<1.0	mg/L	1.4 (1)	20
9348331	Dissolved Sulphate (SO4)	2019/03/12	82	80 - 120	96	80 - 120	<1.0	mg/L	5.1 (1)	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Duplicate Parent ID

(2) Matrix Spike Parent ID [VI4138-03]

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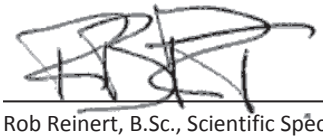
Maxxam Job #: B917080
Report Date: 2019/03/18

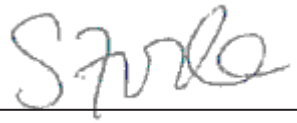
GHD Limited
Client Project #: 88877-07-02
Your P.O. #: 73506780
Sampler Initials: RR

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Rob Reinert, B.Sc., Scientific Specialist



Suwan Fock, B.Sc., QP, Inorganics Senior Analyst

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam Analytics International Corporation o/a Maxxam Analytics
4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5 Tel:(604) 734 7276 Toll-free:800-563-6266 Fax:(604) 731 2386 www.maxxam.ca

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INVOICE TO:

Company Name: #163 GHD Limited Proj # 088877-07-02
Contact Name: Airesse MacPhee
Address: 651 COLBY DRIVE, WATERLOO ON N2V 1C2
Phone: (519) 884-0510 Fax: (519) 725-1394
Email: airesse.macphee@ghd.com; NationalEDDSupport@ma

Report Information

Company Name:
Contact Name: Airesse MacPhee
Address:
Phone: Fax:
Email: airesse.macphee@ghd.com; NationalEDDSupport@ma

Project Information

Quotation #: B80076
P.O. #:
Project #: 088877
Project Name:
Site #:
Sampled By: Rose Marie Rocca

B917080_COC

C#578692-02-01

Lab Use Only

Bottle Order #: 578692
Project Manager: Nahed Amer

Regulatory Criteria:
- [X] CSR
- [ ] CCME
- [ ] BC Water Quality
- [ ] Other

Special Instructions: * SHORT HOLDING TIMES * + 2 COOLERS *

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals Field Filtered ? (Y / N)	Speciated Alkalinity- Water	TDS, PH, Conductivity	Ammonia-N (Preserved), COD	LL Sulphide/H2S calc	CSR/CCME Diss. Metals in Water w/ CV Hg incl. Hardness	CSR/CCME Tot. Metals in Water w/ CV Hg	CSR BTEX/VPH in Water	CSR PAH in Water by GC-MS	High Lvl Anion Pkg (Cl, NO2, NO3, SO4,)- WTR	BOD, TSS	# of Bottles	Comments
1		WL-088877-070319-RMR-07	March 7/19	14:30	WL	Y	X	X	X	X	X	X	X	X	X	X	14	Total Metals + Hg preserved
2																		Diss. Metals + Hg filtered + preserved
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT: [X]
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
1 DAY [ ] 2 Day [ ] 3 Day [ ] Date Required: [ ]
Rush Confirmation Number: (call lab for #)

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Rose Marie Rocca	19/03/08	8:00	PEDRO TACE	2019/03/08	15:50	

Lab Use Only: Time Sensitive [ ] | Temperature (°C) on Receipt: 9.4.5 | Custody Seal Intact on Cooler? N/A [ ] Yes [ ] No

1,3,5

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO MAXXAM'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.MAXXAM.CA/TERMS.
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Maxxam Yellow: Client

965

Maxxam Analytics International Corporation o/a Maxxam Analytics

Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your Project #: 88877-07-02
Site#: 88877-07-02
Your C.O.C. #: 578692-01-01

Attention: Airesse MacPhee

GHD Limited
651 COLBY DRIVE
WATERLOO, ON
CANADA N2V 1C2

Report Date: 2019/03/18
Report #: R2698854
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B917081
Received: 2019/03/08, 15:50

Sample Matrix: GROUND WATER
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity - Water	6	N/A	2019/03/11	BBY6SOP-00026	SM 22 2320 B m
Chloride by Automated Colourimetry	6	N/A	2019/03/12	BBY6SOP-00011	SM 22 4500-Cl- E m
COD by Colorimeter	6	N/A	2019/03/12	BBY6SOP-00024	SM 22 5220 D m
Conductance - water	6	N/A	2019/03/11	BBY6SOP-00026	SM 22 2510 B m
Sulphide (as H2S) (1)	6	N/A	2019/03/12	AB WI-00065	Auto Calc
Hardness (calculated as CaCO3)	6	N/A	2019/03/12	BBY WI-00033	Auto Calc
Mercury (Dissolved) by CVAF	6	N/A	2019/03/09	BBY7SOP-00015	BCMOE BCLM Oct2013 m
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	6	N/A	2019/03/12	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	6	N/A	2019/03/11	BBY7SOP-00002	EPA 6020b R2 m
Ammonia-N (Total) (1)	6	N/A	2019/03/13	AB SOP-00007	SM 23 4500 NH3 A G m
Nitrate + Nitrite (N) (highlevel)	6	N/A	2019/03/09	BBY6SOP-00010	SM 23 4500-NO3- I m
Nitrite (N) by CFA (highlevel)	6	N/A	2019/03/09	BBY6SOP-00010	SM 23 4500-NO3- I m
Nitrogen - Nitrate (as N)	6	N/A	2019/03/09	BBY WI-00033	Auto Calc
Filter and HNO3 Preserve for Metals	6	N/A	2019/03/08	BBY7 WI-00004	SM 23 3030B m
pH Water (2)	6	N/A	2019/03/11	BBY6SOP-00026	SM 22 4500-H+ B m
Orthophosphate by Konelab	6	N/A	2019/03/09	BBY6SOP-00013	SM 23 4500-P E m
Total Sulphide (1)	6	N/A	2019/03/12	AB SOP-00080	SM 23 4500 S2-A D Fm
Sulphate by Automated Colourimetry	3	N/A	2019/03/12	BBY6SOP-00017	SM 22 4500-SO42- E m
Sulphate by Automated Colourimetry	3	N/A	2019/03/13	BBY6SOP-00017	SM 22 4500-SO42- E m
Total Dissolved Solids (Filt. Residue) (1)	1	2019/03/13	2019/03/13	AB SOP-00065	SM 23 2540 C m
Total Dissolved Solids (Filt. Residue)	5	2019/03/11	2019/03/12	BBY6SOP-00033	SM 23 2540 C m

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity - Water	1	N/A	2019/03/11	BBY6SOP-00026	SM 22 2320 B m
Biochemical Oxygen Demand	1	2019/03/09	2019/03/14	BBY6SOP-00045	SM 23 5210 B m
BTEX/MTBE LH, VH, F1 SIM/MS	1	N/A	2019/03/12	BBY8SOP-00010/11/12	BCMOE BCLM Jul 2017
Chloride by Automated Colourimetry	1	N/A	2019/03/12	BBY6SOP-00011	SM 22 4500-Cl- E m
COD by Colorimeter	1	N/A	2019/03/12	BBY6SOP-00024	SM 22 5220 D m
Conductance - water	1	N/A	2019/03/11	BBY6SOP-00026	SM 22 2510 B m
Sulphide (as H2S) (1)	1	N/A	2019/03/12	AB WI-00065	Auto Calc

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Your Project #: 88877-07-02
Site#: 88877-07-02
Your C.O.C. #: 578692-01-01

Attention: Airesse MacPhee

GHD Limited
651 COLBY DRIVE
WATERLOO, ON
CANADA N2V 1C2

Report Date: 2019/03/18
Report #: R2698854
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B917081
Received: 2019/03/08, 15:50

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hardness Total (calculated as CaCO3) (3)	1	N/A	2019/03/12	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	1	N/A	2019/03/12	BBY WI-00033	Auto Calc
Mercury (Dissolved) by CVAF	1	N/A	2019/03/09	BBY7SOP-00015	BCMOE BCLM Oct2013 m
Mercury (Total) by CVAF	1	2019/03/09	2019/03/09	BBY7SOP-00015	BCMOE BCLM Oct2013 m
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	1	N/A	2019/03/12	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	1	N/A	2019/03/11	BBY7SOP-00002	EPA 6020b R2 m
Na, K, Ca, Mg, S by CRC ICPMS (total)	1	2019/03/08	2019/03/12	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (total)	1	2019/03/11	2019/03/11	BBY7SOP-00003 BBY7SOP-00002	EPA 6020b R2 m
Ammonia-N (Total) (1)	1	N/A	2019/03/13	AB SOP-00007	SM 23 4500 NH3 A G m
Nitrate + Nitrite (N) (highlevel)	1	N/A	2019/03/09	BBY6SOP-00010	SM 23 4500-NO3- I m
Nitrite (N) by CFA (highlevel)	1	N/A	2019/03/09	BBY6SOP-00010	SM 23 4500-NO3- I m
Nitrogen - Nitrate (as N)	1	N/A	2019/03/09	BBY WI-00033	Auto Calc
PAH in Water by GC/MS (SIM)	1	2019/03/12	2019/03/12	BBY8SOP-00021	BCMOE BCLM Jul2017m
Total LMW, HMW, Total PAH Calc (4)	1	N/A	2019/03/13	BBY WI-00033	Auto Calc
Filter and HNO3 Preserve for Metals	1	N/A	2019/03/08	BBY7 WI-00004	SM 23 3030B m
pH Water (2)	1	N/A	2019/03/11	BBY6SOP-00026	SM 22 4500-H+ B m
Orthophosphate by Konelab	1	N/A	2019/03/09	BBY6SOP-00013	SM 23 4500-P E m
Total Sulphide (1)	1	N/A	2019/03/12	AB SOP-00080	SM 23 4500 S2-A D Fm
Sulphate by Automated Colourimetry	1	N/A	2019/03/12	BBY6SOP-00017	SM 22 4500-SO42- E m
Total Dissolved Solids (Filt. Residue)	1	2019/03/11	2019/03/12	BBY6SOP-00033	SM 23 2540 C m
Total Suspended Solids (NFR) (1)	1	2019/03/13	2019/03/13	AB SOP-00061	SM 23 2540 D m
Volatile HC-BTEX (5)	1	N/A	2019/03/13	BBY WI-00033	Auto Calc

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Your Project #: 88877-07-02
Site#: 88877-07-02
Your C.O.C. #: 578692-01-01

Attention: Airesse MacPhee

GHD Limited
651 COLBY DRIVE
WATERLOO, ON
CANADA N2V 1C2

Report Date: 2019/03/18
Report #: R2698854
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B917081
Received: 2019/03/08, 15:50

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam Calgary Environmental
(2) The BC-MOE and APHA Standard Method require pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the BC-MOE/APHA Standard Method holding time.
(3) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).
(4) Total PAHs in Water include: Quinoline, Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Acridine, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b&j)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, and Benzo(g,h,i)perylene.
(5) VPH = VH - (Benzene + Toluene + Ethylbenzene + m & p-Xylene + o-Xylene + Styrene)

Encryption Key

Parminder Virk
Project Manager
18 Mar 2019 16:14:06

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Parminder Virk, Project Manager
Email: PVirk@maxxam.ca
Phone# (403)735-2235

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B917081
Report Date: 2019/03/18

GHD Limited
Client Project #: 88877-07-02
Sampler Initials: RR

RESULTS OF CHEMICAL ANALYSES OF GROUND WATER

Maxxam ID		VI4140		VI4141	VI4141		
Sampling Date		2019/03/06 10:00		2019/03/06 11:30	2019/03/06 11:30		
COC Number		578692-01-01		578692-01-01	578692-01-01		
	UNITS	WG-88877-060319-RWR-02	QC Batch	WG-88877-060319-RWR-03	WG-88877-060319-RWR-03 Lab-Dup	RDL	QC Batch
ANIONS							
Nitrite (N)	mg/L	<0.10	9345088	<0.10	N/A	0.10	9345088
Calculated Parameters							
Filter and HNO3 Preservation	N/A	FIELD	ONSITE	FIELD	N/A	N/A	ONSITE
Nitrate (N)	mg/L	0.14	9344089	<0.10	N/A	0.10	9344089
Sulphide (as H2S)	mg/L	<0.0020	9343489	<0.0020	N/A	0.0020	9343489
Demand Parameters							
Chemical Oxygen Demand	mg/L	<10	9345764	<10	<10	10	9345764
Misc. Inorganics							
Alkalinity (Total as CaCO3)	mg/L	69.1	9346446	34.3	N/A	1.0	9346458
Alkalinity (PP as CaCO3)	mg/L	<1.0	9346446	<1.0	N/A	1.0	9346458
Bicarbonate (HCO3)	mg/L	84.3	9346446	41.8	N/A	1.0	9346458
Carbonate (CO3)	mg/L	<1.0	9346446	<1.0	N/A	1.0	9346458
Hydroxide (OH)	mg/L	<1.0	9346446	<1.0	N/A	1.0	9346458
Anions							
Dissolved Sulphate (SO4)	mg/L	4.3	9348905	2.3	N/A	1.0	9348331
Total Sulphide	mg/L	<0.0019	9346763	<0.0019	N/A	0.0019	9346763
Dissolved Chloride (Cl)	mg/L	3.6	9348330	<1.0	N/A	1.0	9348330
Nutrients							
Total Ammonia (N)	mg/L	<0.015	9348091	<0.015	N/A	0.015	9348091
Orthophosphate (P)	mg/L	0.0113	9345294	0.0225	N/A	0.0050	9345294
Nitrate plus Nitrite (N)	mg/L	0.14	9345087	<0.10	N/A	0.10	9345087
Physical Properties							
Conductivity	uS/cm	149	9346444	73.2	N/A	2.0	9346457
pH	pH	7.85	9346439	7.53	N/A	N/A	9346453
Physical Properties							
Total Dissolved Solids	mg/L	80	9345673	34	N/A	10	9345673

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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Maxxam Job #: B917081
Report Date: 2019/03/18

GHD Limited
Client Project #: 88877-07-02
Sampler Initials: RR

RESULTS OF CHEMICAL ANALYSES OF GROUND WATER

Maxxam ID		VI4142		VI4143	VI4144		
Sampling Date		2019/03/06 12:00		2019/03/06 13:00	2019/03/06 14:00		
COC Number		578692-01-01		578692-01-01	578692-01-01		
	UNITS	WG-88877-060319-RWR-04	QC Batch	WG-88877-060319-RWR-05	WG-88877-060319-RWR-06	RDL	QC Batch
ANIONS							
Nitrite (N)	mg/L	<0.10	9345088	<0.10	<0.10	0.10	9345088
Calculated Parameters							
Filter and HNO3 Preservation	N/A	FIELD	ONSITE	FIELD	FIELD	N/A	ONSITE
Nitrate (N)	mg/L	<0.10	9344089	0.61	0.58	0.10	9344089
Sulphide (as H2S)	mg/L	<0.0020	9343489	<0.0020	<0.0020	0.0020	9343489
Demand Parameters							
Chemical Oxygen Demand	mg/L	<10	9345764	<10	<10	10	9345764
Misc. Inorganics							
Alkalinity (Total as CaCO3)	mg/L	34.3	9346446	103	43.9	1.0	9346446
Alkalinity (PP as CaCO3)	mg/L	<1.0	9346446	<1.0	<1.0	1.0	9346446
Bicarbonate (HCO3)	mg/L	41.9	9346446	125	53.5	1.0	9346446
Carbonate (CO3)	mg/L	<1.0	9346446	<1.0	<1.0	1.0	9346446
Hydroxide (OH)	mg/L	<1.0	9346446	<1.0	<1.0	1.0	9346446
Anions							
Dissolved Sulphate (SO4)	mg/L	2.2	9348905	13.6	6.2	1.0	9348331
Total Sulphide	mg/L	<0.0019	9346763	<0.0019	<0.0019	0.0019	9346763
Dissolved Chloride (Cl)	mg/L	<1.0	9348330	5.7	7.7	1.0	9348330
Nutrients							
Total Ammonia (N)	mg/L	<0.015	9348091	<0.015	<0.015	0.015	9348091
Orthophosphate (P)	mg/L	0.0221	9345294	0.0072	0.0056	0.0050	9345294
Nitrate plus Nitrite (N)	mg/L	<0.10	9345087	0.61	0.58	0.10	9345087
Physical Properties							
Conductivity	uS/cm	73.1	9346444	246	126	2.0	9346444
pH	pH	7.49	9346439	7.92	7.56	N/A	9346439
Physical Properties							
Total Dissolved Solids	mg/L	36	9345673	132	38	10	9345673

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B917081
Report Date: 2019/03/18

GHD Limited
Client Project #: 88877-07-02
Sampler Initials: RR

RESULTS OF CHEMICAL ANALYSES OF GROUND WATER

Maxxam ID		VI4145		
Sampling Date		2019/03/06 14:30		
COC Number		578692-01-01		
	UNITS	WG-88877-060319-RWR-08	RDL	QC Batch
ANIONS				
Nitrite (N)	mg/L	<0.10	0.10	9345088
Calculated Parameters				
Filter and HNO3 Preservation	N/A	FIELD	N/A	ONSITE
Nitrate (N)	mg/L	<0.10	0.10	9344089
Sulphide (as H2S)	mg/L	<0.0020	0.0020	9343489
Demand Parameters				
Chemical Oxygen Demand	mg/L	<10	10	9345764
Misc. Inorganics				
Alkalinity (Total as CaCO3)	mg/L	<1.0	1.0	9346446
Alkalinity (PP as CaCO3)	mg/L	<1.0	1.0	9346446
Bicarbonate (HCO3)	mg/L	<1.0	1.0	9346446
Carbonate (CO3)	mg/L	<1.0	1.0	9346446
Hydroxide (OH)	mg/L	<1.0	1.0	9346446
Total Dissolved Solids	mg/L	<10	10	9347577
Anions				
Dissolved Sulphate (SO4)	mg/L	<1.0	1.0	9348905
Total Sulphide	mg/L	<0.0019	0.0019	9346763
Dissolved Chloride (Cl)	mg/L	<1.0	1.0	9348330
Nutrients				
Total Ammonia (N)	mg/L	0.017	0.015	9348091
Orthophosphate (P)	mg/L	<0.0050	0.0050	9345294
Nitrate plus Nitrite (N)	mg/L	<0.10	0.10	9345087
Physical Properties				
Conductivity	uS/cm	<2.0	2.0	9346444
pH	pH	5.93	N/A	9346439

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B917081
Report Date: 2019/03/18

GHD Limited
Client Project #: 88877-07-02
Sampler Initials: RR

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		VI4139	VI4139		
Sampling Date		2019/03/06 14:30	2019/03/06 14:30		
COC Number		578692-01-01	578692-01-01		
	UNITS	W-88877-060319-RWR-01	W-88877-060319-RWR-01 Lab-Dup	RDL	QC Batch
ANIONS					
Nitrite (N)	mg/L	<0.10	N/A	0.10	9345088
Calculated Parameters					
Filter and HNO3 Preservation	N/A	FIELD	N/A	N/A	ONSITE
Nitrate (N)	mg/L	<0.10	N/A	0.10	9344089
Sulphide (as H2S)	mg/L	0.017	N/A	0.010	9343489
Demand Parameters					
Biochemical Oxygen Demand	mg/L	<6.0	N/A	6.0	9345035
Chemical Oxygen Demand	mg/L	45	41	10	9343178
Misc. Inorganics					
Alkalinity (Total as CaCO3)	mg/L	172	N/A	1.0	9346446
Alkalinity (PP as CaCO3)	mg/L	<1.0	N/A	1.0	9346446
Bicarbonate (HCO3)	mg/L	210	N/A	1.0	9346446
Carbonate (CO3)	mg/L	<1.0	N/A	1.0	9346446
Hydroxide (OH)	mg/L	<1.0	N/A	1.0	9346446
Total Suspended Solids	mg/L	1.2	N/A	1.0	9347578
Anions					
Dissolved Sulphate (SO4)	mg/L	168	N/A	1.0	9348331
Total Sulphide	mg/L	0.016 (1)	N/A	0.0095	9346763
Dissolved Chloride (Cl)	mg/L	85	N/A	1.0	9348330
Nutrients					
Total Ammonia (N)	mg/L	0.30	N/A	0.015	9348091
Orthophosphate (P)	mg/L	<0.0050	N/A	0.0050	9345294
Nitrate plus Nitrite (N)	mg/L	<0.10	N/A	0.10	9345087
Physical Properties					
Conductivity	uS/cm	911	N/A	2.0	9346444
pH	pH	7.62	N/A	N/A	9346439
Physical Properties					
Total Dissolved Solids	mg/L	546	N/A	10	9345673

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Sample pH <9, preservation incomplete. Due to volatility of analyte, a low bias in the results is likely. Detection limits raised due to sample matrix.

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Maxxam Job #: B917081
Report Date: 2019/03/18

GHD Limited
Client Project #: 88877-07-02
Sampler Initials: RR

CSR BTEX/VPH IN WATER (WATER)

Maxxam ID		VI4139		
Sampling Date		2019/03/06 14:30		
COC Number		578692-01-01		
	UNITS	W-88877-060319-RWR-01	RDL	QC Batch
Calculated Parameters				
VPH (VHW6 to 10 - BTEX)	ug/L	<300	300	9344101
Volatiles				
Methyl-tert-butylether (MTBE)	ug/L	<4.0	4.0	9345947
Benzene	ug/L	<0.40	0.40	9345947
Toluene	ug/L	<0.40	0.40	9345947
Ethylbenzene	ug/L	<0.40	0.40	9345947
m & p-Xylene	ug/L	<0.40	0.40	9345947
o-Xylene	ug/L	<0.40	0.40	9345947
Styrene	ug/L	<0.40	0.40	9345947
Xylenes (Total)	ug/L	<0.40	0.40	9345947
VH C6-C10	ug/L	<300	300	9345947
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	97	N/A	9345947
4-Bromofluorobenzene (sur.)	%	107	N/A	9345947
D4-1,2-Dichloroethane (sur.)	%	118	N/A	9345947

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B917081
Report Date: 2019/03/18

GHD Limited
Client Project #: 88877-07-02
Sampler Initials: RR

CSR/CCME DISS. METALS IN WATER W/ CV HG (GROUND WATER)

Maxxam ID		VI4140	VI4141	VI4142	VI4143		
Sampling Date		2019/03/06 10:00	2019/03/06 11:30	2019/03/06 12:00	2019/03/06 13:00		
COC Number		578692-01-01	578692-01-01	578692-01-01	578692-01-01		
	UNITS	WG-88877-060319-RWR-02	WG-88877-060319-RWR-03	WG-88877-060319-RWR-04	WG-88877-060319-RWR-05	RDL	QC Batch
Calculated Parameters							
Dissolved Hardness (CaCO3)	mg/L	55.5	30.6	30.5	103	0.50	9343549
Elements							
Dissolved Mercury (Hg)	ug/L	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	9345094
Dissolved Metals by ICPMS							
Dissolved Aluminum (Al)	ug/L	<3.0	7.2	7.0	3.4	3.0	9345859
Dissolved Antimony (Sb)	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	9345859
Dissolved Arsenic (As)	ug/L	0.47	0.85	0.85	0.12	0.10	9345859
Dissolved Barium (Ba)	ug/L	7.5	3.6	2.9	2.5	1.0	9345859
Dissolved Beryllium (Be)	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	9345859
Dissolved Bismuth (Bi)	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	9345859
Dissolved Boron (B)	ug/L	<50	<50	<50	<50	50	9345859
Dissolved Cadmium (Cd)	ug/L	<0.010	<0.010	<0.010	<0.010	0.010	9345859
Dissolved Chromium (Cr)	ug/L	1.4	<1.0	<1.0	<1.0	1.0	9345859
Dissolved Cobalt (Co)	ug/L	<0.20	<0.20	<0.20	<0.20	0.20	9345859
Dissolved Copper (Cu)	ug/L	1.23	0.38	<0.20	0.33	0.20	9345859
Dissolved Iron (Fe)	ug/L	6.0	7.0	<5.0	6.2	5.0	9345859
Dissolved Lead (Pb)	ug/L	<0.20	<0.20	<0.20	<0.20	0.20	9345859
Dissolved Lithium (Li)	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	9345859
Dissolved Manganese (Mn)	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	9345859
Dissolved Molybdenum (Mo)	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	9345859
Dissolved Nickel (Ni)	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	9345859
Dissolved Selenium (Se)	ug/L	0.10	0.10	<0.10	0.20	0.10	9345859
Dissolved Silicon (Si)	ug/L	5840	3740	3690	6180	100	9345859
Dissolved Silver (Ag)	ug/L	<0.020	<0.020	<0.020	<0.020	0.020	9345859
Dissolved Strontium (Sr)	ug/L	27.1	14.1	13.6	54.1	1.0	9345859
Dissolved Thallium (Tl)	ug/L	<0.010	<0.010	<0.010	<0.010	0.010	9345859
Dissolved Tin (Sn)	ug/L	<5.0	<5.0	<5.0	<5.0	5.0	9345859
Dissolved Titanium (Ti)	ug/L	<5.0	<5.0	<5.0	<5.0	5.0	9345859
Dissolved Uranium (U)	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	9345859
Dissolved Vanadium (V)	ug/L	<5.0	6.3	6.2	<5.0	5.0	9345859
Dissolved Zinc (Zn)	ug/L	<5.0	<5.0	<5.0	<5.0	5.0	9345859
Dissolved Zirconium (Zr)	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	9345859

RDL = Reportable Detection Limit

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GHD Limited
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CSR/CCME DISS. METALS IN WATER W/ CV HG (GROUND WATER)

Maxxam ID		VI4140	VI4141	VI4142	VI4143		
Sampling Date		2019/03/06 10:00	2019/03/06 11:30	2019/03/06 12:00	2019/03/06 13:00		
COC Number		578692-01-01	578692-01-01	578692-01-01	578692-01-01		
	UNITS	WG-88877-060319-RWR-02	WG-88877-060319-RWR-03	WG-88877-060319-RWR-04	WG-88877-060319-RWR-05	RDL	QC Batch
Dissolved Calcium (Ca)	mg/L	17.9	9.97	9.97	32.6	0.050	9344080
Dissolved Magnesium (Mg)	mg/L	2.60	1.38	1.37	5.22	0.050	9344080
Dissolved Potassium (K)	mg/L	0.341	0.168	0.160	0.301	0.050	9344080
Dissolved Sodium (Na)	mg/L	6.28	0.940	0.921	5.44	0.050	9344080
Dissolved Sulphur (S)	mg/L	<3.0	<3.0	<3.0	4.1	3.0	9344080
RDL = Reportable Detection Limit							

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CSR/CCME DISS. METALS IN WATER W/ CV HG (GROUND WATER)

Maxxam ID		VI4144	VI4145		
Sampling Date		2019/03/06 14:00	2019/03/06 14:30		
COC Number		578692-01-01	578692-01-01		
	UNITS	WG-88877-060319-RWR-06	WG-88877-060319-RWR-08	RDL	QC Batch
Calculated Parameters					
Dissolved Hardness (CaCO3)	mg/L	40.3	<0.50	0.50	9343549
Elements					
Dissolved Mercury (Hg)	ug/L	<0.0020	<0.0020	0.0020	9345094
Dissolved Metals by ICPMS					
Dissolved Aluminum (Al)	ug/L	<3.0	<3.0	3.0	9345859
Dissolved Antimony (Sb)	ug/L	<0.50	<0.50	0.50	9345859
Dissolved Arsenic (As)	ug/L	<0.10	<0.10	0.10	9345859
Dissolved Barium (Ba)	ug/L	1.3	<1.0	1.0	9345859
Dissolved Beryllium (Be)	ug/L	<0.10	<0.10	0.10	9345859
Dissolved Bismuth (Bi)	ug/L	<1.0	<1.0	1.0	9345859
Dissolved Boron (B)	ug/L	<50	<50	50	9345859
Dissolved Cadmium (Cd)	ug/L	<0.010	<0.010	0.010	9345859
Dissolved Chromium (Cr)	ug/L	<1.0	<1.0	1.0	9345859
Dissolved Cobalt (Co)	ug/L	<0.20	<0.20	0.20	9345859
Dissolved Copper (Cu)	ug/L	0.35	<0.20	0.20	9345859
Dissolved Iron (Fe)	ug/L	<5.0	<5.0	5.0	9345859
Dissolved Lead (Pb)	ug/L	<0.20	<0.20	0.20	9345859
Dissolved Lithium (Li)	ug/L	<2.0	<2.0	2.0	9345859
Dissolved Manganese (Mn)	ug/L	<1.0	<1.0	1.0	9345859
Dissolved Molybdenum (Mo)	ug/L	<1.0	<1.0	1.0	9345859
Dissolved Nickel (Ni)	ug/L	<1.0	<1.0	1.0	9345859
Dissolved Selenium (Se)	ug/L	0.21	<0.10	0.10	9345859
Dissolved Silicon (Si)	ug/L	4320	<100	100	9345859
Dissolved Silver (Ag)	ug/L	<0.020	<0.020	0.020	9345859
Dissolved Strontium (Sr)	ug/L	24.4	<1.0	1.0	9345859
Dissolved Thallium (Tl)	ug/L	<0.010	<0.010	0.010	9345859
Dissolved Tin (Sn)	ug/L	<5.0	<5.0	5.0	9345859
Dissolved Titanium (Ti)	ug/L	<5.0	<5.0	5.0	9345859
Dissolved Uranium (U)	ug/L	<0.10	<0.10	0.10	9345859
Dissolved Vanadium (V)	ug/L	<5.0	<5.0	5.0	9345859
Dissolved Zinc (Zn)	ug/L	<5.0	<5.0	5.0	9345859
Dissolved Zirconium (Zr)	ug/L	<0.10	<0.10	0.10	9345859
RDL = Reportable Detection Limit					

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CSR/CCME DISS. METALS IN WATER W/ CV HG (GROUND WATER)

Maxxam ID		VI4144	VI4145		
Sampling Date		2019/03/06 14:00	2019/03/06 14:30		
COC Number		578692-01-01	578692-01-01		
	UNITS	WG-88877-060319-RWR-06	WG-88877-060319-RWR-08	RDL	QC Batch
Dissolved Calcium (Ca)	mg/L	12.0	<0.050	0.050	9344080
Dissolved Magnesium (Mg)	mg/L	2.54	<0.050	0.050	9344080
Dissolved Potassium (K)	mg/L	0.177	<0.050	0.050	9344080
Dissolved Sodium (Na)	mg/L	7.78	<0.050	0.050	9344080
Dissolved Sulphur (S)	mg/L	<3.0	<3.0	3.0	9344080
RDL = Reportable Detection Limit					

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Sampler Initials: RR

CSR/CCME DISS. METALS IN WATER W/ CV HG (WATER)

Maxxam ID		VI4139		
Sampling Date		2019/03/06 14:30		
COC Number		578692-01-01		
	UNITS	W-88877-060319-RWR-01	RDL	QC Batch
Calculated Parameters				
Dissolved Hardness (CaCO3)	mg/L	280	0.50	9343549
Elements				
Dissolved Mercury (Hg)	ug/L	<0.0020	0.0020	9345094
Dissolved Metals by ICPMS				
Dissolved Aluminum (Al)	ug/L	8.4	6.0	9345859
Dissolved Antimony (Sb)	ug/L	<1.0	1.0	9345859
Dissolved Arsenic (As)	ug/L	0.45	0.20	9345859
Dissolved Barium (Ba)	ug/L	32.5	2.0	9345859
Dissolved Beryllium (Be)	ug/L	<0.20	0.20	9345859
Dissolved Bismuth (Bi)	ug/L	<2.0	2.0	9345859
Dissolved Boron (B)	ug/L	<100	100	9345859
Dissolved Cadmium (Cd)	ug/L	0.182	0.020	9345859
Dissolved Chromium (Cr)	ug/L	3.8	2.0	9345859
Dissolved Cobalt (Co)	ug/L	21.7	0.40	9345859
Dissolved Copper (Cu)	ug/L	2.26	0.40	9345859
Dissolved Iron (Fe)	ug/L	50	10	9351282
Dissolved Lead (Pb)	ug/L	<0.40	0.40	9345859
Dissolved Lithium (Li)	ug/L	<4.0	4.0	9345859
Dissolved Manganese (Mn)	ug/L	13600	2.0	9345859
Dissolved Molybdenum (Mo)	ug/L	<2.0	2.0	9345859
Dissolved Nickel (Ni)	ug/L	10.5	2.0	9345859
Dissolved Selenium (Se)	ug/L	<0.20	0.20	9345859
Dissolved Silicon (Si)	ug/L	4650	200	9345859
Dissolved Silver (Ag)	ug/L	<0.040	0.040	9345859
Dissolved Strontium (Sr)	ug/L	268	2.0	9345859
Dissolved Thallium (Tl)	ug/L	<0.020	0.020	9345859
Dissolved Tin (Sn)	ug/L	<10	10	9345859
Dissolved Titanium (Ti)	ug/L	<10	10	9345859
Dissolved Uranium (U)	ug/L	<0.20	0.20	9345859
Dissolved Vanadium (V)	ug/L	<10	10	9345859
Dissolved Zinc (Zn)	ug/L	13	10	9345859
Dissolved Zirconium (Zr)	ug/L	<0.20	0.20	9345859
RDL = Reportable Detection Limit				

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CSR/CCME DISS. METALS IN WATER W/ CV HG (WATER)

Maxxam ID		VI4139		
Sampling Date		2019/03/06 14:30		
COC Number		578692-01-01		
	UNITS	W-88877-060319-RWR-01	RDL	QC Batch
Dissolved Calcium (Ca)	mg/L	74.0	0.10	9344080
Dissolved Magnesium (Mg)	mg/L	23.2	0.10	9344080
Dissolved Potassium (K)	mg/L	3.87	0.10	9344080
Dissolved Sodium (Na)	mg/L	54.1	0.10	9344080
Dissolved Sulphur (S)	mg/L	51.6	6.0	9344080
RDL = Reportable Detection Limit				

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GHD Limited
Client Project #: 88877-07-02
Sampler Initials: RR

CSR/CCME TOT. METALS IN WATER W/ CV HG (WATER)

Maxxam ID		VI4139		
Sampling Date		2019/03/06 14:30		
COC Number		578692-01-01		
	UNITS	W-88877-060319-RWR-01	RDL	QC Batch
Calculated Parameters				
Total Hardness (CaCO3)	mg/L	281	0.50	9343548
Elements				
Total Mercury (Hg)	ug/L	<0.0020	0.0020	9345057
Total Metals by ICPMS				
Total Aluminum (Al)	ug/L	<15	15	9345432
Total Antimony (Sb)	ug/L	<2.5	2.5	9345432
Total Arsenic (As)	ug/L	<0.50	0.50	9345432
Total Barium (Ba)	ug/L	34.1	5.0	9345432
Total Beryllium (Be)	ug/L	<0.50	0.50	9345432
Total Bismuth (Bi)	ug/L	<5.0	5.0	9345432
Total Boron (B)	ug/L	<250	250	9345432
Total Cadmium (Cd)	ug/L	0.150	0.050	9345432
Total Chromium (Cr)	ug/L	9.6	5.0	9345432
Total Cobalt (Co)	ug/L	22.0	1.0	9345432
Total Copper (Cu)	ug/L	<2.5	2.5	9345432
Total Iron (Fe)	ug/L	98	50	9345432
Total Lead (Pb)	ug/L	<1.0	1.0	9345432
Total Lithium (Li)	ug/L	<10	10	9345432
Total Manganese (Mn)	ug/L	12900	5.0	9345432
Total Molybdenum (Mo)	ug/L	<5.0	5.0	9345432
Total Nickel (Ni)	ug/L	11.4	5.0	9345432
Total Selenium (Se)	ug/L	<0.50	0.50	9345432
Total Silicon (Si)	ug/L	4430	500	9345432
Total Silver (Ag)	ug/L	<0.10	0.10	9345432
Total Strontium (Sr)	ug/L	258	5.0	9345432
Total Thallium (Tl)	ug/L	<0.050	0.050	9345432
Total Tin (Sn)	ug/L	<25	25	9345432
Total Titanium (Ti)	ug/L	<25	25	9345432
Total Uranium (U)	ug/L	<0.50	0.50	9345432
Total Vanadium (V)	ug/L	<25	25	9345432
Total Zinc (Zn)	ug/L	<25	25	9345432
Total Zirconium (Zr)	ug/L	<0.50	0.50	9345432
RDL = Reportable Detection Limit				

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CSR/CCME TOT. METALS IN WATER W/ CV HG (WATER)

Maxxam ID		VI4139		
Sampling Date		2019/03/06 14:30		
COC Number		578692-01-01		
	UNITS	**W-88877-060319-RWR-01**	**RDL**	**QC Batch**
Total Calcium (Ca)	mg/L	74.0	0.25	9344087
Total Magnesium (Mg)	mg/L	23.3	0.25	9344087
Total Potassium (K)	mg/L	4.23	0.25	9344087
Total Sodium (Na)	mg/L	50.9	0.25	9344087
Total Sulphur (S)	mg/L	49	15	9344087
RDL = Reportable Detection Limit				

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CSR PAH IN WATER BY GC-MS (WATER)

Maxxam ID		VI4139		
Sampling Date		2019/03/06 14:30		
COC Number		578692-01-01		
	UNITS	W-88877-060319-RWR-01	RDL	QC Batch
Calculated Parameters				
Low Molecular Weight PAH`s	ug/L	<0.10	0.10	9344093
High Molecular Weight PAH`s	ug/L	<0.050	0.050	9344093
Total PAH	ug/L	<0.10	0.10	9344093
Polycyclic Aromatics				
Quinoline	ug/L	<0.020	0.020	9346822
Naphthalene	ug/L	<0.10	0.10	9346822
1-Methylnaphthalene	ug/L	<0.050	0.050	9346822
2-Methylnaphthalene	ug/L	<0.10	0.10	9346822
Acenaphthylene	ug/L	<0.050	0.050	9346822
Acenaphthene	ug/L	<0.050	0.050	9346822
Fluorene	ug/L	<0.050	0.050	9346822
Phenanthrene	ug/L	<0.050	0.050	9346822
Anthracene	ug/L	<0.010	0.010	9346822
Acridine	ug/L	<0.050	0.050	9346822
Fluoranthene	ug/L	<0.020	0.020	9346822
Pyrene	ug/L	<0.020	0.020	9346822
Benzo(a)anthracene	ug/L	<0.010	0.010	9346822
Chrysene	ug/L	<0.020	0.020	9346822
Benzo(b&j)fluoranthene	ug/L	<0.030	0.030	9346822
Benzo(k)fluoranthene	ug/L	<0.050	0.050	9346822
Benzo(a)pyrene	ug/L	<0.0050	0.0050	9346822
Indeno(1,2,3-cd)pyrene	ug/L	<0.050	0.050	9346822
Dibenz(a,h)anthracene	ug/L	<0.0030	0.0030	9346822
Benzo(g,h,i)perylene	ug/L	<0.050	0.050	9346822
Surrogate Recovery (%)				
D10-ANTHRACENE (sur.)	%	86	N/A	9346822
D8-ACENAPHTHYLENE (sur.)	%	87	N/A	9346822
D8-NAPHTHALENE (sur.)	%	69	N/A	9346822
TERPHENYL-D14 (sur.)	%	84	N/A	9346822

RDL = Reportable Detection Limit
N/A = Not Applicable

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GENERAL COMMENTS

CSR/CCME DISS. METALS IN WATER W/ CV HG (WATER) Comments

Sample VI4139 [W-88877-060319-RWR-01] Elements by CRC ICPMS (dissolved): RDL raised due to sample matrix interference and sample dilution required.

Sample VI4139 [W-88877-060319-RWR-01] Elements by CRC ICPMS (dissolved): RDL raised due to concentration over linear range, sample dilution required

CSR/CCME TOT. METALS IN WATER W/ CV HG (WATER) Comments

Sample VI4139 [W-88877-060319-RWR-01] Elements by CRC ICPMS (total): RDL raised due to concentration over linear range, sample dilution required

Sample VI4139, Elements by CRC ICPMS (dissolved): Test repeated.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

GHD Limited
Client Project #: 88877-07-02
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			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9345947	1,4-Difluorobenzene (sur.)	2019/03/12	94	70 - 130	97	70 - 130	98	%		
9345947	4-Bromofluorobenzene (sur.)	2019/03/12	102	70 - 130	100	70 - 130	107	%		
9345947	D4-1,2-Dichloroethane (sur.)	2019/03/12	101	70 - 130	98	70 - 130	108	%		
9346822	D10-ANTHRACENE (sur.)	2019/03/12	90 (6)	50 - 140	93	50 - 140	94	%		
9346822	D8-ACENAPHTHYLENE (sur.)	2019/03/12	92 (6)	50 - 140	91	50 - 140	94	%		
9346822	D8-NAPHTHALENE (sur.)	2019/03/12	77 (6)	50 - 140	77	50 - 140	81	%		
9346822	TERPHENYL-D14 (sur.)	2019/03/12	89 (6)	50 - 140	89	50 - 140	88	%		
9343178	Chemical Oxygen Demand	2019/03/12	97 (1)	80 - 120	96	80 - 120	<10	mg/L	11 (2)	20
9345035	Biochemical Oxygen Demand	2019/03/14			98	85 - 115	<6.0	mg/L		
9345057	Total Mercury (Hg)	2019/03/09	86	80 - 120	94	80 - 120	<0.0020	ug/L	NC (3)	20
9345087	Nitrate plus Nitrite (N)	2019/03/09			109	80 - 120	<0.10	mg/L		
9345088	Nitrite (N)	2019/03/09			101	80 - 120	<0.10	mg/L		
9345094	Dissolved Mercury (Hg)	2019/03/09	103	80 - 120	95	80 - 120	<0.0020	ug/L	NC (3)	20
9345294	Orthophosphate (P)	2019/03/09	86	80 - 120	101	80 - 120	<0.0050	mg/L	NC (3)	20
9345432	Total Aluminum (Al)	2019/03/11	117	80 - 120	99	80 - 120	<3.0	ug/L	4.3 (3)	20
9345432	Total Antimony (Sb)	2019/03/11	99	80 - 120	98	80 - 120	<0.50	ug/L	NC (3)	20
9345432	Total Arsenic (As)	2019/03/11	97	80 - 120	96	80 - 120	<0.10	ug/L	6.7 (3)	20
9345432	Total Barium (Ba)	2019/03/11	98	80 - 120	93	80 - 120	<1.0	ug/L	5.6 (3)	20
9345432	Total Beryllium (Be)	2019/03/11	98	80 - 120	100	80 - 120	<0.10	ug/L	NC (3)	20
9345432	Total Bismuth (Bi)	2019/03/11	97	80 - 120	100	80 - 120	<1.0	ug/L	NC (3)	20
9345432	Total Boron (B)	2019/03/11	104	80 - 120	109	80 - 120	<50	ug/L	NC (3)	20
9345432	Total Cadmium (Cd)	2019/03/11	99	80 - 120	97	80 - 120	<0.010	ug/L	NC (3)	20
9345432	Total Chromium (Cr)	2019/03/11	97	80 - 120	94	80 - 120	<1.0	ug/L	NC (3)	20
9345432	Total Cobalt (Co)	2019/03/11	97	80 - 120	96	80 - 120	<0.20	ug/L	NC (3)	20
9345432	Total Copper (Cu)	2019/03/11	96	80 - 120	94	80 - 120	<0.50	ug/L	11 (3)	20
9345432	Total Iron (Fe)	2019/03/11	107	80 - 120	108	80 - 120	<10	ug/L	0.44 (3)	20
9345432	Total Lead (Pb)	2019/03/11	98	80 - 120	99	80 - 120	<0.20	ug/L	0.47 (3)	20
9345432	Total Lithium (Li)	2019/03/11	97	80 - 120	98	80 - 120	<2.0	ug/L	NC (3)	20
9345432	Total Manganese (Mn)	2019/03/11	97	80 - 120	94	80 - 120	<1.0	ug/L	3.8 (3)	20
9345432	Total Molybdenum (Mo)	2019/03/11	98	80 - 120	96	80 - 120	<1.0	ug/L	NC (3)	20
9345432	Total Nickel (Ni)	2019/03/11	95	80 - 120	94	80 - 120	<1.0	ug/L	NC (3)	20
9345432	Total Selenium (Se)	2019/03/11	101	80 - 120	98	80 - 120	<0.10	ug/L	NC (3)	20

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QUALITY ASSURANCE REPORT(CONT'D)

GHD Limited
Client Project #: 88877-07-02
Sampler Initials: RR

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9345432	Total Silicon (Si)	2019/03/11	99	80 - 120	102	80 - 120	<100	ug/L	5.0 (3)	20
9345432	Total Silver (Ag)	2019/03/11	99	80 - 120	97	80 - 120	<0.020	ug/L	NC (3)	20
9345432	Total Strontium (Sr)	2019/03/11	NC	80 - 120	96	80 - 120	<1.0	ug/L	3.3 (3)	20
9345432	Total Thallium (Tl)	2019/03/11	99	80 - 120	100	80 - 120	<0.010	ug/L	NC (3)	20
9345432	Total Tin (Sn)	2019/03/11	98	80 - 120	98	80 - 120	<5.0	ug/L	NC (3)	20
9345432	Total Titanium (Ti)	2019/03/11	110	80 - 120	96	80 - 120	<5.0	ug/L	8.3 (3)	20
9345432	Total Uranium (U)	2019/03/11	99	80 - 120	101	80 - 120	<0.10	ug/L	NC (3)	20
9345432	Total Vanadium (V)	2019/03/11	98	80 - 120	94	80 - 120	<5.0	ug/L	NC (3)	20
9345432	Total Zinc (Zn)	2019/03/11	96	80 - 120	96	80 - 120	<5.0	ug/L	12 (3)	20
9345432	Total Zirconium (Zr)	2019/03/11	94	80 - 120	97	80 - 120	<0.10	ug/L	NC (3)	20
9345673	Total Dissolved Solids	2019/03/12	NC	80 - 120	93	80 - 120	<10	mg/L	1.1 (3)	20
9345764	Chemical Oxygen Demand	2019/03/12	109 (4)	80 - 120	96	80 - 120	<10	mg/L	NC (5)	20
9345859	Dissolved Aluminum (Al)	2019/03/11	98	80 - 120	99	80 - 120	<3.0	ug/L	12 (3)	20
9345859	Dissolved Antimony (Sb)	2019/03/11	99	80 - 120	97	80 - 120	<0.50	ug/L	NC (3)	20
9345859	Dissolved Arsenic (As)	2019/03/11	101	80 - 120	100	80 - 120	<0.10	ug/L	3.3 (3)	20
9345859	Dissolved Barium (Ba)	2019/03/11	NC	80 - 120	99	80 - 120	<1.0	ug/L	5.2 (3)	20
9345859	Dissolved Beryllium (Be)	2019/03/11	95	80 - 120	97	80 - 120	<0.10	ug/L	NC (3)	20
9345859	Dissolved Bismuth (Bi)	2019/03/11	93	80 - 120	102	80 - 120	<1.0	ug/L	NC (3)	20
9345859	Dissolved Boron (B)	2019/03/11	99	80 - 120	101	80 - 120	<50	ug/L	6.7 (3)	20
9345859	Dissolved Cadmium (Cd)	2019/03/11	96	80 - 120	100	80 - 120	<0.010	ug/L	3.0 (3)	20
9345859	Dissolved Chromium (Cr)	2019/03/11	93	80 - 120	98	80 - 120	<1.0	ug/L	0.82 (3)	20
9345859	Dissolved Cobalt (Co)	2019/03/11	90	80 - 120	98	80 - 120	<0.20	ug/L	6.3 (3)	20
9345859	Dissolved Copper (Cu)	2019/03/11	84	80 - 120	95	80 - 120	<0.20	ug/L	0.11 (3)	20
9345859	Dissolved Iron (Fe)	2019/03/11	94	80 - 120	98	80 - 120	<5.0	ug/L	3.0 (3)	20
9345859	Dissolved Lead (Pb)	2019/03/11	93	80 - 120	101	80 - 120	<0.20	ug/L	NC (3)	20
9345859	Dissolved Lithium (Li)	2019/03/11	96	80 - 120	103	80 - 120	<2.0	ug/L	3.6 (3)	20
9345859	Dissolved Manganese (Mn)	2019/03/11	NC	80 - 120	100	80 - 120	<1.0	ug/L	2.5 (3)	20
9345859	Dissolved Molybdenum (Mo)	2019/03/11	NC	80 - 120	103	80 - 120	<1.0	ug/L	3.0 (3)	20
9345859	Dissolved Nickel (Ni)	2019/03/11	86	80 - 120	96	80 - 120	<1.0	ug/L	1.7 (3)	20
9345859	Dissolved Selenium (Se)	2019/03/11	99	80 - 120	98	80 - 120	<0.10	ug/L	0.76 (3)	20
9345859	Dissolved Silicon (Si)	2019/03/11	NC	80 - 120	99	80 - 120	<100	ug/L	1.6 (3)	20
9345859	Dissolved Silver (Ag)	2019/03/11	95	80 - 120	101	80 - 120	<0.020	ug/L	NC (3)	20

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Maxxam Job #: B917081
Report Date: 2019/03/18

QUALITY ASSURANCE REPORT(CONT'D)

GHD Limited
Client Project #: 88877-07-02
Sampler Initials: RR

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9345859	Dissolved Strontium (Sr)	2019/03/11	NC	80 - 120	99	80 - 120	<1.0	ug/L	2.7 (3)	20
9345859	Dissolved Thallium (Tl)	2019/03/11	97	80 - 120	102	80 - 120	<0.010	ug/L	1.6 (3)	20
9345859	Dissolved Tin (Sn)	2019/03/11	99	80 - 120	97	80 - 120	<5.0	ug/L	NC (3)	20
9345859	Dissolved Titanium (Ti)	2019/03/11	96	80 - 120	98	80 - 120	<5.0	ug/L	NC (3)	20
9345859	Dissolved Uranium (U)	2019/03/11	104	80 - 120	105	80 - 120	<0.10	ug/L	1.3 (3)	20
9345859	Dissolved Vanadium (V)	2019/03/11	95	80 - 120	98	80 - 120	<5.0	ug/L	NC (3)	20
9345859	Dissolved Zinc (Zn)	2019/03/11	96	80 - 120	98	80 - 120	<5.0	ug/L	NC (3)	20
9345859	Dissolved Zirconium (Zr)	2019/03/11	103	80 - 120	100	80 - 120	<0.10	ug/L	7.3 (3)	20
9345947	Benzene	2019/03/12	101	70 - 130	103	70 - 130	<0.40	ug/L	NC (3)	30
9345947	Ethylbenzene	2019/03/12	113	70 - 130	108	70 - 130	<0.40	ug/L	NC (3)	30
9345947	m & p-Xylene	2019/03/12	106	70 - 130	112	70 - 130	<0.40	ug/L	NC (3)	30
9345947	Methyl-tert-butylether (MTBE)	2019/03/12	108	70 - 130	104	70 - 130	<4.0	ug/L	NC (3)	30
9345947	o-Xylene	2019/03/12	110	70 - 130	106	70 - 130	<0.40	ug/L	NC (3)	30
9345947	Styrene	2019/03/12	106	70 - 130	101	70 - 130	<0.40	ug/L	NC (3)	30
9345947	Toluene	2019/03/12	106	70 - 130	102	70 - 130	<0.40	ug/L	1.8 (3)	30
9345947	VH C6-C10	2019/03/12			94	70 - 130	<300	ug/L	NC (3)	30
9345947	Xylenes (Total)	2019/03/12					<0.40	ug/L	NC (3)	30
9346439	pH	2019/03/11			102	97 - 103				
9346444	Conductivity	2019/03/11			100	80 - 120	<2.0	uS/cm		
9346446	Alkalinity (PP as CaCO3)	2019/03/11					<1.0	mg/L	NC (3)	20
9346446	Alkalinity (Total as CaCO3)	2019/03/11	NC	80 - 120	101	80 - 120	<1.0	mg/L	0.087 (3)	20
9346446	Bicarbonate (HCO3)	2019/03/11					<1.0	mg/L	0.087 (3)	20
9346446	Carbonate (CO3)	2019/03/11					<1.0	mg/L	NC (3)	20
9346446	Hydroxide (OH)	2019/03/11					<1.0	mg/L	NC (3)	20
9346453	pH	2019/03/12			101	97 - 103			0.22 (3)	20
9346457	Conductivity	2019/03/11			101	80 - 120	<2.0	uS/cm		
9346458	Alkalinity (PP as CaCO3)	2019/03/11					<1.0	mg/L		
9346458	Alkalinity (Total as CaCO3)	2019/03/11	NC	80 - 120	92	80 - 120	<1.0	mg/L		
9346458	Bicarbonate (HCO3)	2019/03/11					<1.0	mg/L		
9346458	Carbonate (CO3)	2019/03/11					<1.0	mg/L		
9346458	Hydroxide (OH)	2019/03/11					<1.0	mg/L		
9346763	Total Sulphide	2019/03/12			96	80 - 120	<0.0019	mg/L	1.2 (3)	20

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Maxxam Job #: B917081
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QUALITY ASSURANCE REPORT(CONT'D)

GHD Limited
Client Project #: 88877-07-02
Sampler Initials: RR

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9346822	1-Methylnaphthalene	2019/03/12	97 (6)	50 - 140	86	50 - 140	<0.050	ug/L		
9346822	2-Methylnaphthalene	2019/03/12	91 (6)	50 - 140	81	50 - 140	<0.10	ug/L	NC (3)	40
9346822	Acenaphthene	2019/03/12	97 (6)	50 - 140	89	50 - 140	<0.050	ug/L	4.9 (3)	40
9346822	Acenaphthylene	2019/03/12	98 (6)	50 - 140	89	50 - 140	<0.050	ug/L	NC (3)	40
9346822	Acridine	2019/03/12	108 (6)	50 - 140	102	50 - 140	<0.050	ug/L	NC (3)	40
9346822	Anthracene	2019/03/12	103 (6)	50 - 140	95	50 - 140	<0.010	ug/L	NC (3)	40
9346822	Benzo(a)anthracene	2019/03/12	109 (6)	50 - 140	100	50 - 140	<0.010	ug/L	NC (3)	40
9346822	Benzo(a)pyrene	2019/03/12	107 (6)	50 - 140	97	50 - 140	<0.0050	ug/L	NC (3)	40
9346822	Benzo(b&j)fluoranthene	2019/03/12	108 (6)	50 - 140	97	50 - 140	<0.030	ug/L	NC (3)	40
9346822	Benzo(g,h,i)perylene	2019/03/12	108 (6)	50 - 140	103	50 - 140	<0.050	ug/L	NC (3)	40
9346822	Benzo(k)fluoranthene	2019/03/12	107 (6)	50 - 140	104	50 - 140	<0.050	ug/L	NC (3)	40
9346822	Chrysene	2019/03/12	105 (6)	50 - 140	96	50 - 140	<0.020	ug/L	NC (3)	40
9346822	Dibenz(a,h)anthracene	2019/03/12	103 (6)	50 - 140	98	50 - 140	<0.0030	ug/L	NC (3)	40
9346822	Fluoranthene	2019/03/12	102 (6)	50 - 140	95	50 - 140	<0.020	ug/L	NC (3)	40
9346822	Fluorene	2019/03/12	104 (6)	50 - 140	93	50 - 140	<0.050	ug/L	NC (3)	40
9346822	Indeno(1,2,3-cd)pyrene	2019/03/12	102 (6)	50 - 140	98	50 - 140	<0.050	ug/L	NC (3)	40
9346822	Naphthalene	2019/03/12	84 (6)	50 - 140	77	50 - 140	<0.10	ug/L	NC (3)	40
9346822	Phenanthrene	2019/03/12	96 (6)	50 - 140	89	50 - 140	<0.050	ug/L	NC (3)	40
9346822	Pyrene	2019/03/12	98 (6)	50 - 140	92	50 - 140	<0.020	ug/L	NC (3)	40
9346822	Quinoline	2019/03/12	111 (6)	50 - 140	104	50 - 140	<0.020	ug/L	NC (3)	40
9347577	Total Dissolved Solids	2019/03/13	95	80 - 120	104	80 - 120	<10	mg/L	1.3 (3)	20
9347578	Total Suspended Solids	2019/03/13	107	80 - 120	98	80 - 120	<1.0	mg/L	6.5 (3)	20
9348091	Total Ammonia (N)	2019/03/13	NC	80 - 120	108	80 - 120	<0.015	mg/L	0.59 (3)	20
9348330	Dissolved Chloride (Cl)	2019/03/12	81	80 - 120	101	80 - 120	<1.0	mg/L	1.4 (3)	20
9348331	Dissolved Sulphate (SO4)	2019/03/12	82	80 - 120	96	80 - 120	<1.0	mg/L	5.1 (3)	20
9348905	Dissolved Sulphate (SO4)	2019/03/13			99	80 - 120	<1.0	mg/L		

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Maxxam Job #: B917081
Report Date: 2019/03/18

QUALITY ASSURANCE REPORT(CONT'D)

GHD Limited
Client Project #: 88877-07-02
Sampler Initials: RR

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9351282	Dissolved Iron (Fe)	2019/03/15	92	80 - 120	99	80 - 120	<5.0	ug/L	NC (3)	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Matrix Spike Parent ID [VI4139-05]

(2) Duplicate Parent ID [VI4139-05]

(3) Duplicate Parent ID

(4) Matrix Spike Parent ID [VI4141-05]

(5) Duplicate Parent ID [VI4141-05]

(6) Matrix Spike Parent ID [VI4139-11]

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Maxxam Job #: B917081
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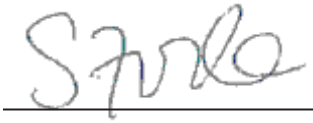
GHD Limited
Client Project #: 88877-07-02
Sampler Initials: RR

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Andy Lu, Ph.D., P.Chem., Scientific Specialist



Suwan Fock, B.Sc., QP, Inorganics Senior Analyst

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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B917081_COC

INVOICE TO:		Report Information		Project Information	
Company Name	#163 GHD Limited Proj# 88877-07-02	Company Name		Quotation #	B30076
Contact Name	Airesse MacPhee	Contact Name	Airesse MacPhee	P.O. #	
Address	651 COLBY DRIVE WATERLOO ON N2V 1C2	Address		Project #	088877
				Project Name	
Phone	(519) 884-0510 Fax (519) 725-1394	Phone	Fax	Site #	
Email	airesse.macphee@ghd.com; NationalEDDSupport@ma	Email	airesse.macphee@ghd.com; NationalEDDSupport@ma	Sampled By	RoseMarie Rocca

Lab Use Only — Bottle Order #: 578692 — Project Manager: Nahed Amer — C#578692-01-01

Regulatory Criteria: CSR / CCME / BC Water Quality / Other

Special Instructions: * SHORT HOLDING TIMES * * 2 coolers *

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects
Regular (Standard) TAT: ☒
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.
Job Specific Rush TAT (if applies to entire submission)
1 DAY ☐ 2 Day ☐ 3 Day ☐ Date Required: ____
Rush Confirmation Number: ____ (call lab for #)

#	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals Field Filtered ? (Y/N)	Speciated Alkalinity-Water + orthophosphate	TDS, PH, Conductivity	Ammonia-N (Preserved), COD	LL Sulphide/H2S calc	CSR/CCME Diss. Metals in Water w/ CV Hg incl. Hardness	CSR/CCME Tot. Metals in Water w/ CV Hg	CSR BTEX/VPH in Water	CSR PAH in Water by GC-MS	High Lvl Anion Pkg (Cl, NO2, NO3, SO4) - WTR	BOD TSS	# of Bottles	Comments
1		W-88877-060319-RMR-01	march 6/19	14:30	W	Y	X	X	X	X	X	X	X	X	X	X	14	FOR SAMPLE IDS W "WG-" : * yellow bottle may not be needed for selected analysis *
2		WG-88877-070319-RMR-02	march 7/19	10:00	GW	Y	X	X	X	X	X				X		6	* orthophosphate for sample IDs w "WG-" *
3		WG-88877-070319-RMR-03	march 7/19	11:30	GW	Y	X	X	X	X	X				X		6	
4		-04		12:00	GW	Y	X	X	X	X	X				X		6	
5		-05		13:00	GW	Y	X	X	X	X	X				X		6	
6		-06		14:00	GW	Y	X	X	X	X	X				X		6	
7		-08		14:30	GW	Y	X	X	X	X	X				X		6	
8																		
9																		
10																		

RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Lab Use Only
RMR ROSE MARIE ROCCA	19/03/08	800	PEDRO TACK	2019/03/08	15:50		Time Sensitive ☐ Temperature (°C) on Receipt 9,4,5 / 1,3,5 Custody Seal Intact on Cooler? N/A ☐ Yes ☐ No

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO MAXXAM'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.MAXXAM.CA/TERMS.
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Maxxam Yellow: Client

966

Maxxam Analytics International Corporation o/a Maxxam Analytics

Maxxam
A Bureau Veritas Group Company

Your P.O. #: 73506780-4
Your Project #: 88877
Site#: 88877
Site Location: UPLAND
Your C.O.C. #: G139855

Attention: Airesse MacPhee

GHD Limited
651 COLBY DRIVE
WATERLOO, ON
CANADA N2V 1C2

Report Date: 2019/05/30
Report #: R2729819
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B935526
Received: 2019/05/11, 09:00

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity - Water	1	N/A	2019/05/16	BBY6SOP-00026	SM 22 2320 B m
BTEX/MTBE LH, VH, F1 SIM/MS	1	N/A	2019/05/14	BBY8SOP-00010/11/12	BCMOE BCLM Jul 2017
Chloride by Automated Colourimetry	1	N/A	2019/05/14	BBY6SOP-00011	SM 22 4500-Cl- E m
COD by Colorimeter	1	N/A	2019/05/17	BBY6SOP-00024	SM 23 5220 D m
Conductance - water	1	N/A	2019/05/14	BBY6SOP-00026	SM 22 2510 B m
Sulphide (as H2S) (1)	1	N/A	2019/05/22		Auto Calc
Hardness (calculated as CaCO3)	1	N/A	2019/05/15	BBY WI-00033	Auto Calc
Mercury (Dissolved) by CV	1	2019/05/15	2019/05/15	BBY7SOP-00015	BCMOE BCLM Oct2013 m
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	1	N/A	2019/05/15	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	1	N/A	2019/05/14	BBY7SOP-00002	EPA 6020b R2 m
Ammonia-N (Total) (1)	1	N/A	2019/05/15	AB SOP-00007	SM 23 4500 NH3 A G m
PAH in Water by GC/MS (SIM)	1	2019/05/17	2019/05/17	BBY8SOP-00021	BCMOE BCLM Jul2017m
Total LMW, HMW, Total PAH Calc (2)	1	N/A	2019/05/21	BBY WI-00033	Auto Calc
Filter and HNO3 Preserve for Metals	1	N/A	2019/05/13	BBY7 WI-00004	SM 23 3030B m
pH Water (3)	1	N/A	2019/05/14	BBY6SOP-00026	SM 22 4500-H+ B m
Total Sulphide (1)	1	N/A	2019/05/21	AB SOP-00080	SM 23 4500 S2-A D Fm
Sulphate by Automated Colourimetry	1	N/A	2019/05/17	BBY6SOP-00017	SM 22 4500-SO42- E m
Total Dissolved Solids (Filt. Residue)	1	2019/05/14	2019/05/15	BBY6SOP-00033	SM 23 2540 C m
Total Suspended Solids (NFR) (1)	1	2019/05/15	2019/05/15	AB SOP-00061	SM 23 2540 D m
Volatile HC-BTEX (4)	1	N/A	2019/05/14	BBY WI-00033	Auto Calc

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam
A Bureau Veritas Group Company

Your P.O. #: 73506780-4
Your Project #: 88877
Site#: 88877
Site Location: UPLAND
Your C.O.C. #: G139855

Attention: Airesse MacPhee

GHD Limited
651 COLBY DRIVE
WATERLOO, ON
CANADA N2V 1C2

Report Date: 2019/05/30
Report #: R2729819
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B935526
Received: 2019/05/11, 09:00

Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Calgary Environmental
(2) Total PAHs in Water include: Quinoline, Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Acridine, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b&j)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, and Benzo(g,h,i)perylene.
(3) The BC-MOE and APHA Standard Method require pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the BC-MOE/APHA Standard Method holding time.
(4) VPH = VH - (Benzene + Toluene + Ethylbenzene + m & p-Xylene + o-Xylene + Styrene)

Encryption Key

Thomas Pinchin
Junior Project Manager
30 May 2019 15:43:02

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Parminder Virk, Key Account Specialist
Email: PVirk@maxxam.ca
Phone# (403)735-2235

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam Job #: B935526
Report Date: 2019/05/30

GHD Limited
Client Project #: 88877
Site Location: UPLAND
Your P.O. #: 73506780-4
Sampler Initials: DB

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		VQ9623	VQ9623		
Sampling Date		2019/05/07 17:00	2019/05/07 17:00		
COC Number		G139855	G139855		
	UNITS	WG-88877-070519-DB-01	WG-88877-070519-DB-01 Lab-Dup	RDL	QC Batch
Calculated Parameters					
Filter and HNO3 Preservation	N/A	FIELD	N/A	N/A	ONSITE
Sulphide (as H2S)	mg/L	0.026	N/A	0.010	9415062
Demand Parameters					
Chemical Oxygen Demand	mg/L	43	N/A	10	9420793
Misc. Inorganics					
Alkalinity (Total as CaCO3)	mg/L	69.1	N/A	1.0	9419304
Alkalinity (PP as CaCO3)	mg/L	<1.0	N/A	1.0	9419304
Bicarbonate (HCO3)	mg/L	84.3	N/A	1.0	9419304
Carbonate (CO3)	mg/L	<1.0	N/A	1.0	9419304
Hydroxide (OH)	mg/L	<1.0	N/A	1.0	9419304
Total Suspended Solids	mg/L	1100 (1)	N/A	5.0	9418786
Anions					
Dissolved Sulphate (SO4)	mg/L	5.7	N/A	1.0	9422816
Total Sulphide	mg/L	0.025 (2)	0.022	0.0095	9426497
Dissolved Chloride (Cl)	mg/L	10	N/A	1.0	9417656
Nutrients					
Total Ammonia (N)	mg/L	0.034	N/A	0.015	9418868
Physical Properties					
Conductivity	uS/cm	175	N/A	2.0	9418322
pH	pH	7.91	N/A	N/A	9418321
Physical Properties					
Total Dissolved Solids	mg/L	128	N/A	10	9415822

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Detection limit raised based on sample volume used for analysis.
(2) Detection limits raised due to sample matrix.

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CSR BTEX/VPH IN WATER (WATER)

Maxxam ID		VQ9623	VQ9623		
Sampling Date		2019/05/07 17:00	2019/05/07 17:00		
COC Number		G139855	G139855		
	UNITS	WG-88877-070519-DB-01	WG-88877-070519-DB-01 Lab-Dup	RDL	QC Batch
Calculated Parameters					
VPH (VHW6 to 10 - BTEX)	ug/L	<300	N/A	300	9413858
Volatiles					
Methyl-tert-butylether (MTBE)	ug/L	<4.0	<4.0	4.0	9416396
Benzene	ug/L	<0.40	<0.40	0.40	9416396
Toluene	ug/L	<0.40	<0.40	0.40	9416396
Ethylbenzene	ug/L	<0.40	<0.40	0.40	9416396
m & p-Xylene	ug/L	<0.40	<0.40	0.40	9416396
o-Xylene	ug/L	<0.40	<0.40	0.40	9416396
Styrene	ug/L	<0.40	<0.40	0.40	9416396
Xylenes (Total)	ug/L	<0.40	<0.40	0.40	9416396
VH C6-C10	ug/L	<300	<300	300	9416396
Surrogate Recovery (%)					
1,4-Difluorobenzene (sur.)	%	101	101	N/A	9416396
4-Bromofluorobenzene (sur.)	%	103	102	N/A	9416396
D4-1,2-Dichloroethane (sur.)	%	100	103	N/A	9416396

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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CSR DISSOLVED METALS IN WATER WITH CV HG (WATER)

Maxxam ID		VQ9623		
Sampling Date		2019/05/07 17:00		
COC Number		G139855		
	UNITS	WG-88877-070519-DB-01	RDL	QC Batch
Calculated Parameters				
Dissolved Hardness (CaCO3)	mg/L	68.4	0.50	9413847
Elements				
Dissolved Mercury (Hg)	ug/L	<0.0020	0.0020	9418401
Dissolved Metals by ICPMS				
Dissolved Aluminum (Al)	ug/L	142	3.0	9417114
Dissolved Antimony (Sb)	ug/L	<0.50	0.50	9417114
Dissolved Arsenic (As)	ug/L	0.39	0.10	9417114
Dissolved Barium (Ba)	ug/L	6.5	1.0	9417114
Dissolved Beryllium (Be)	ug/L	<0.10	0.10	9417114
Dissolved Bismuth (Bi)	ug/L	<1.0	1.0	9417114
Dissolved Boron (B)	ug/L	<50	50	9417114
Dissolved Cadmium (Cd)	ug/L	<0.010	0.010	9417114
Dissolved Chromium (Cr)	ug/L	1.5	1.0	9417114
Dissolved Cobalt (Co)	ug/L	0.24	0.20	9417114
Dissolved Copper (Cu)	ug/L	1.04	0.20	9417114
Dissolved Iron (Fe)	ug/L	190	5.0	9417114
Dissolved Lead (Pb)	ug/L	<0.20	0.20	9417114
Dissolved Lithium (Li)	ug/L	<2.0	2.0	9417114
Dissolved Manganese (Mn)	ug/L	26.0	1.0	9417114
Dissolved Molybdenum (Mo)	ug/L	<1.0	1.0	9417114
Dissolved Nickel (Ni)	ug/L	<1.0	1.0	9417114
Dissolved Selenium (Se)	ug/L	0.15	0.10	9417114
Dissolved Silicon (Si)	ug/L	6960	100	9417114
Dissolved Silver (Ag)	ug/L	<0.020	0.020	9417114
Dissolved Strontium (Sr)	ug/L	53.3	1.0	9417114
Dissolved Thallium (Tl)	ug/L	<0.010	0.010	9417114
Dissolved Tin (Sn)	ug/L	<5.0	5.0	9417114
Dissolved Titanium (Ti)	ug/L	9.3	5.0	9417114
Dissolved Uranium (U)	ug/L	0.13	0.10	9417114
Dissolved Vanadium (V)	ug/L	<5.0	5.0	9417114
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	9417114
RDL = Reportable Detection Limit				

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CSR DISSOLVED METALS IN WATER WITH CV HG (WATER)

Maxxam ID		VQ9623		
Sampling Date		2019/05/07 17:00		
COC Number		G139855		
	UNITS	**WG-88877-070519-DB-01**	**RDL**	**QC Batch**
Dissolved Zirconium (Zr)	ug/L	<0.10	0.10	9417114
Dissolved Calcium (Ca)	mg/L	22.0	0.050	9413848
Dissolved Magnesium (Mg)	mg/L	3.28	0.050	9413848
Dissolved Potassium (K)	mg/L	0.495	0.050	9413848
Dissolved Sodium (Na)	mg/L	6.82	0.050	9413848
Dissolved Sulphur (S)	mg/L	<3.0	3.0	9413848
RDL = Reportable Detection Limit				

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CSR PAH IN WATER BY GC-MS (WATER)

Maxxam ID		VQ9623		
Sampling Date		2019/05/07 17:00		
COC Number		G139855		
	UNITS	WG-88877-070519-DB-01	RDL	QC Batch
Calculated Parameters				
Low Molecular Weight PAH`s	ug/L	<0.10	0.10	9413911
High Molecular Weight PAH`s	ug/L	<0.050	0.050	9413911
Total PAH	ug/L	<0.10	0.10	9413911
Polycyclic Aromatics				
Quinoline	ug/L	<0.020	0.020	9422136
Naphthalene	ug/L	<0.10	0.10	9422136
1-Methylnaphthalene	ug/L	<0.050	0.050	9422136
2-Methylnaphthalene	ug/L	<0.10	0.10	9422136
Acenaphthylene	ug/L	<0.050	0.050	9422136
Acenaphthene	ug/L	<0.050	0.050	9422136
Fluorene	ug/L	<0.050	0.050	9422136
Phenanthrene	ug/L	<0.050	0.050	9422136
Anthracene	ug/L	<0.010	0.010	9422136
Acridine	ug/L	<0.050	0.050	9422136
Fluoranthene	ug/L	<0.020	0.020	9422136
Pyrene	ug/L	<0.020	0.020	9422136
Benzo(a)anthracene	ug/L	<0.010	0.010	9422136
Chrysene	ug/L	<0.020	0.020	9422136
Benzo(b&j)fluoranthene	ug/L	<0.030	0.030	9422136
Benzo(k)fluoranthene	ug/L	<0.050	0.050	9422136
Benzo(a)pyrene	ug/L	<0.0050	0.0050	9422136
Indeno(1,2,3-cd)pyrene	ug/L	<0.050	0.050	9422136
Dibenz(a,h)anthracene	ug/L	<0.0030	0.0030	9422136
Benzo(g,h,i)perylene	ug/L	<0.050	0.050	9422136
Surrogate Recovery (%)				
D10-ANTHRACENE (sur.)	%	95	N/A	9422136
D8-ACENAPHTHYLENE (sur.)	%	93	N/A	9422136
D8-NAPHTHALENE (sur.)	%	93	N/A	9422136
TERPHENYL-D14 (sur.)	%	99	N/A	9422136

RDL = Reportable Detection Limit
N/A = Not Applicable

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GENERAL COMMENTS

Version 2: Revised report issued to include results for Speciated Alkalinity as per request from Airesse MacPhee on 2019/05/29

Version 3: Split Report issued to include results for all analysis except total metals/Hg/Hardness as per request from Airesse MacPhee on 2019/05/29

Sample VQ9623 [WG-88877-070519-DB-01] : Sample was analyzed past method specified hold time for Total Suspended Solids (NFR). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample was analyzed past method specified hold time for Total Sulphide.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

GHD Limited
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			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9416396	1,4-Difluorobenzene (sur.)	2019/05/14	101 (3)	70 - 130	102	70 - 130	101	%		
9416396	4-Bromofluorobenzene (sur.)	2019/05/14	102 (3)	70 - 130	101	70 - 130	101	%		
9416396	D4-1,2-Dichloroethane (sur.)	2019/05/14	101 (3)	70 - 130	105	70 - 130	101	%		
9422136	D10-ANTHRACENE (sur.)	2019/05/17	92 (5)	50 - 140	96	50 - 140	92	%		
9422136	D8-ACENAPHTHYLENE (sur.)	2019/05/17	91 (5)	50 - 140	96	50 - 140	89	%		
9422136	D8-NAPHTHALENE (sur.)	2019/05/17	90 (5)	50 - 140	96	50 - 140	86	%		
9422136	TERPHENYL-D14 (sur.)	2019/05/17	99 (5)	50 - 140	98	50 - 140	94	%		
9415822	Total Dissolved Solids	2019/05/15	100 (1)	80 - 120	99	80 - 120	<10	mg/L	3.5 (2)	20
9416396	Benzene	2019/05/14	104 (3)	70 - 130	100	70 - 130	<0.40	ug/L	NC (4)	30
9416396	Ethylbenzene	2019/05/14	117 (3)	70 - 130	112	70 - 130	<0.40	ug/L	NC (4)	30
9416396	m & p-Xylene	2019/05/14	111 (3)	70 - 130	106	70 - 130	<0.40	ug/L	NC (4)	30
9416396	Methyl-tert-butylether (MTBE)	2019/05/14	105 (3)	70 - 130	102	70 - 130	<4.0	ug/L	NC (4)	30
9416396	o-Xylene	2019/05/14	110 (3)	70 - 130	107	70 - 130	<0.40	ug/L	NC (4)	30
9416396	Styrene	2019/05/14	105 (3)	70 - 130	101	70 - 130	<0.40	ug/L	NC (4)	30
9416396	Toluene	2019/05/14	106 (3)	70 - 130	102	70 - 130	<0.40	ug/L	NC (4)	30
9416396	VH C6-C10	2019/05/14			92	70 - 130	<300	ug/L	NC (4)	30
9416396	Xylenes (Total)	2019/05/14					<0.40	ug/L	NC (4)	30
9417114	Dissolved Aluminum (Al)	2019/05/14	100	80 - 120	100	80 - 120	<3.0	ug/L	0.18 (2)	20
9417114	Dissolved Antimony (Sb)	2019/05/14	101	80 - 120	100	80 - 120	<0.50	ug/L	3.4 (2)	20
9417114	Dissolved Arsenic (As)	2019/05/14	102	80 - 120	99	80 - 120	<0.10	ug/L	0.26 (2)	20
9417114	Dissolved Barium (Ba)	2019/05/14	NC	80 - 120	101	80 - 120	<1.0	ug/L	1.1 (2)	20
9417114	Dissolved Beryllium (Be)	2019/05/14	101	80 - 120	102	80 - 120	<0.10	ug/L	NC (2)	20
9417114	Dissolved Bismuth (Bi)	2019/05/14	97	80 - 120	103	80 - 120	<1.0	ug/L	NC (2)	20
9417114	Dissolved Boron (B)	2019/05/14	103	80 - 120	107	80 - 120	<50	ug/L	5.2 (2)	20
9417114	Dissolved Cadmium (Cd)	2019/05/14	100	80 - 120	100	80 - 120	<0.010	ug/L	18 (2)	20
9417114	Dissolved Chromium (Cr)	2019/05/14	101	80 - 120	102	80 - 120	<1.0	ug/L	1.4 (2)	20
9417114	Dissolved Cobalt (Co)	2019/05/14	99	80 - 120	101	80 - 120	<0.20	ug/L	0.67 (2)	20
9417114	Dissolved Copper (Cu)	2019/05/14	94	80 - 120	98	80 - 120	<0.20	ug/L	2.7 (2)	20
9417114	Dissolved Iron (Fe)	2019/05/14	99	80 - 120	103	80 - 120	<5.0	ug/L	NC (2)	20
9417114	Dissolved Lead (Pb)	2019/05/14	102	80 - 120	103	80 - 120	<0.20	ug/L	NC (2)	20
9417114	Dissolved Lithium (Li)	2019/05/14	97	80 - 120	101	80 - 120	<2.0	ug/L	0.71 (2)	20

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9417114	Dissolved Manganese (Mn)	2019/05/14	101	80 - 120	101	80 - 120	<1.0	ug/L	NC (2)	20
9417114	Dissolved Molybdenum (Mo)	2019/05/14	NC	80 - 120	97	80 - 120	<1.0	ug/L	0.50 (2)	20
9417114	Dissolved Nickel (Ni)	2019/05/14	97	80 - 120	100	80 - 120	<1.0	ug/L	0.095 (2)	20
9417114	Dissolved Selenium (Se)	2019/05/14	100	80 - 120	102	80 - 120	<0.10	ug/L	1.5 (2)	20
9417114	Dissolved Silicon (Si)	2019/05/14	104	80 - 120	101	80 - 120	<100	ug/L	0.45 (2)	20
9417114	Dissolved Silver (Ag)	2019/05/14	100	80 - 120	102	80 - 120	<0.020	ug/L	NC (2)	20
9417114	Dissolved Strontium (Sr)	2019/05/14	NC	80 - 120	103	80 - 120	<1.0	ug/L	4.4 (2)	20
9417114	Dissolved Thallium (Tl)	2019/05/14	100	80 - 120	103	80 - 120	<0.010	ug/L	0 (2)	20
9417114	Dissolved Tin (Sn)	2019/05/14	102	80 - 120	103	80 - 120	<5.0	ug/L	NC (2)	20
9417114	Dissolved Titanium (Ti)	2019/05/14	111	80 - 120	101	80 - 120	<5.0	ug/L	NC (2)	20
9417114	Dissolved Uranium (U)	2019/05/14	105	80 - 120	103	80 - 120	<0.10	ug/L	1.8 (2)	20
9417114	Dissolved Vanadium (V)	2019/05/14	106	80 - 120	100	80 - 120	<5.0	ug/L	NC (2)	20
9417114	Dissolved Zinc (Zn)	2019/05/14	99	80 - 120	101	80 - 120	<5.0	ug/L	NC (2)	20
9417114	Dissolved Zirconium (Zr)	2019/05/14	108	80 - 120	99	80 - 120	<0.10	ug/L	NC (2)	20
9417656	Dissolved Chloride (Cl)	2019/05/14	101	80 - 120	99	80 - 120	<1.0	mg/L	NC (2)	20
9418321	pH	2019/05/14			101	97 - 103				
9418322	Conductivity	2019/05/14			100	80 - 120	<2.0	uS/cm		
9418401	Dissolved Mercury (Hg)	2019/05/15	103	80 - 120	97	80 - 120	<0.0020	ug/L	NC (2)	20
9418786	Total Suspended Solids	2019/05/15	97	80 - 120	94	80 - 120	<1.0	mg/L	NC (2)	20
9418868	Total Ammonia (N)	2019/05/15	93	80 - 120	103	80 - 120	<0.015	mg/L	NC (2)	20
9419304	Alkalinity (PP as CaCO3)	2019/05/16					<1.0	mg/L	NC (2)	20
9419304	Alkalinity (Total as CaCO3)	2019/05/16	NC	80 - 120	101	80 - 120	<1.0	mg/L	3.0 (2)	20
9419304	Bicarbonate (HCO3)	2019/05/16					<1.0	mg/L	3.0 (2)	20
9419304	Carbonate (CO3)	2019/05/16					<1.0	mg/L	NC (2)	20
9419304	Hydroxide (OH)	2019/05/16					<1.0	mg/L	NC (2)	20
9420793	Chemical Oxygen Demand	2019/05/17	102	80 - 120	96	80 - 120	<10	mg/L	9.6 (2)	20
9422136	1-Methylnaphthalene	2019/05/17	93 (5)	50 - 140	95	50 - 140	<0.050	ug/L		
9422136	2-Methylnaphthalene	2019/05/17	95 (5)	50 - 140	95	50 - 140	<0.10	ug/L	NC (2)	40
9422136	Acenaphthene	2019/05/17	93 (5)	50 - 140	95	50 - 140	<0.050	ug/L	NC (2)	40
9422136	Acenaphthylene	2019/05/17	92 (5)	50 - 140	95	50 - 140	<0.050	ug/L	NC (2)	40
9422136	Acridine	2019/05/17	110 (5)	50 - 140	108	50 - 140	<0.050	ug/L	NC (2)	40

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QUALITY ASSURANCE REPORT(CONT'D)

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Site Location: UPLAND
Your P.O. #: 73506780-4
Sampler Initials: DB

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9422136	Anthracene	2019/05/17	95 (5)	50 - 140	98	50 - 140	<0.010	ug/L	NC (2)	40
9422136	Benzo(a)anthracene	2019/05/17	101 (5)	50 - 140	108	50 - 140	<0.010	ug/L	NC (2)	40
9422136	Benzo(a)pyrene	2019/05/17	92 (5)	50 - 140	99	50 - 140	<0.0050	ug/L	NC (2)	40
9422136	Benzo(b&j)fluoranthene	2019/05/17	93 (5)	50 - 140	104	50 - 140	<0.030	ug/L	NC (2)	40
9422136	Benzo(g,h,i)perylene	2019/05/17	74 (5)	50 - 140	93	50 - 140	<0.050	ug/L	NC (2)	40
9422136	Benzo(k)fluoranthene	2019/05/17	98 (5)	50 - 140	108	50 - 140	<0.050	ug/L	NC (2)	40
9422136	Chrysene	2019/05/17	100 (5)	50 - 140	109	50 - 140	<0.020	ug/L	NC (2)	40
9422136	Dibenz(a,h)anthracene	2019/05/17	81 (5)	50 - 140	96	50 - 140	<0.0030	ug/L	NC (2)	40
9422136	Fluoranthene	2019/05/17	104 (5)	50 - 140	100	50 - 140	<0.020	ug/L	NC (2)	40
9422136	Fluorene	2019/05/17	97 (5)	50 - 140	96	50 - 140	<0.050	ug/L	NC (2)	40
9422136	Indeno(1,2,3-cd)pyrene	2019/05/17	75 (5)	50 - 140	91	50 - 140	<0.050	ug/L	NC (2)	40
9422136	Naphthalene	2019/05/17	91 (5)	50 - 140	92	50 - 140	<0.10	ug/L	NC (2)	40
9422136	Phenanthrene	2019/05/17	95 (5)	50 - 140	96	50 - 140	<0.050	ug/L	NC (2)	40
9422136	Pyrene	2019/05/17	102 (5)	50 - 140	98	50 - 140	<0.020	ug/L	NC (2)	40
9422136	Quinoline	2019/05/17	115 (5)	50 - 140	112	50 - 140	<0.020	ug/L	NC (2)	40
9422816	Dissolved Sulphate (SO4)	2019/05/17	NC	80 - 120	97	80 - 120	<1.0	mg/L	2.0 (2)	20

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9426497	Total Sulphide	2019/05/21			115	80 - 120	<0.0019	mg/L	10 (6)	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Matrix Spike Parent ID [VQ9623-01]

(2) Duplicate Parent ID

(3) Matrix Spike Parent ID [VQ9623-14]

(4) Duplicate Parent ID [VQ9623-14]

(5) Matrix Spike Parent ID [VQ9623-13]

(6) Duplicate Parent ID [VQ9623-12]

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Maxxam Job #: B935526
Report Date: 2019/05/30

GHD Limited
Client Project #: 88877
Site Location: UPLAND
Your P.O. #: 73506780-4
Sampler Initials: DB

VALIDATION SIGNATURE PAGE

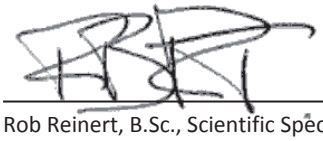
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Andy Lu, Ph.D., P.Chem., Scientific Specialist

Ghayasuddin Khan, M.Sc., P.Chem., QP, Scientific Specialist, Inorganics

Jose Cueva, Supervisor, Organics-VOC & HC

Harry (Peng) Liang, Senior Analyst



Rob Reinert, B.Sc., Scientific Specialist

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Maxxam
A Bureau Veritas Group Company

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5 Toll Free (800) 665 8566
Victoria: 460 Tennyson Place, Unit 1, Victoria, BC V8Z 6S8 Toll Free (866) 385-6112
maxxam.ca

CHAIN OF CUSTODY RECORD

Page 1 of

G139

Invoice Information		Report Information (if differs from invoice)		Project Information		Turnaround Time (TAT) Required	
Company:	GHD	Company:		Quotation		☒ 5 - 7 Days Regular (Most analyses)	
Contact Name:	Airesse MacPhee	Contact Name:		P.O. #/AFE#:	735067804	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PRO	
Address:	165-10271 Shellbridge Way PC:	Address: PC:		Project #:	88877	Rush TAT (Surcharges will be applied)	
Phone/Fax:	604-214-0510	Phone/Fax:		Site Location:	Upland	☐ Same Day ☐ 2 Days ☐ 1 Day ☐ 3-4 Days	
Email:		Email:		Site #:		Date Required:	
Copies:		Copies:		Sampled By:	D. Botero M. Dyck	Rush Confirmation #:	

Laboratory Use Only

	YES	NO	Cooler ID			
Seal Present		X	Temp:	3	4	5
Seal Intact	—					
Cooling Media	X					

	YES	NO	Cooler ID			
Seal Present			Temp			
Seal Intact						
Cooling Media						

	YES	NO	Cooler ID			
Seal Present			Temp			
Seal Intact						
Cooling Media						

Depot Reception

please incl. hardness for total and dissolved metals.

Analysis Requested

	Sample Identification	Date Sampled (yyyy/mm/dd)	Time Sampled (hh:mm)	Matrix	# of Containers	BTEXS / VPH	BTEX F1	PAH	EPH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	TSS	pH	Nitrite	Hydrogen sulphide	sulphide	HOLD - DO NOT ANALYZE
	☐ MTBE								☐ F2 - F4	☒ Preserved?	☒ Preserved?	☒ Field Preserved?	☒ Field Preserved?	☒ Sulphate	☒ COD	☒ Alkalinity	☒ Ammonia			
	☐ VOC / BTEX / VPH								☐ TEH	☒ Filtered?	☒ Filtered?	☒ Field Preserved?		☐ Fluoride	☐ BOD	☒ Conductivity	☐ Nitrate			
	☐ VOC / BTEX / F1														☒ TDS					
	☐ LEPH / HEPH / PAH																			
1	WG-88877-070519-DB-01	2019/05/07	17:00	WG	16	X	X	X		X	X	X	X	X	X	X	X	X	X	
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Regulatory Criteria

- ☐ BC CSR
- ☐ YK CSR
- ☐ CCME
- ☐ Drinking Water
- ☐ BC Water Quality
- ☐ Other

Special Instructions

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgement and acceptance of our terms

Relinquished by: (Signature/ Print)	Date (yyyy/mm/dd):	Time (hh:mm):	Received by: (Signature/ Print)	Date (yyyy/mm/dd):	Time (hh:mm):
Michael Dyck	2019/05/10	21:20	D. Botero Tack	2019/05/11	09:00

B935526_COC

COC-1020 478

Maxxam Analytics Success Through Science©

Your P.O. #: 73506780-4
Your Project #: 88877-11-07
Site#: 88877-11-07
Site Location: 7295 GOLD RIVER HIGHWAY
Your C.O.C. #: 591106-01-01

Attention: Rose Marie Rocca

GHD Limited
10271 Shellbridge Way
Suite 165
Richmond, BC
Canada V6X 2W8

Report Date: 2019/10/08
Report #: R2793484
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: B984003
Received: 2019/10/01, 12:05

Sample Matrix: Ground Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	3	N/A	2019/10/03	BBY6SOP-00026	SM 23 2320 B m
Chloride/Sulphate by Auto Colourimetry	2	N/A	2019/10/03	BBY6SOP-00011 / BBY6SOP-00017	SM23-4500-Cl/SO4-E m
Conductivity @25C	3	N/A	2019/10/03	BBY6SOP-00026	SM 22 2510 B m
Sulphide (as H2S) (1)	2	N/A	2019/10/07	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	2	N/A	2019/10/04	BBY WI-00033	Auto Calc
Mercury (Dissolved) by CV	2	2019/10/03	2019/10/03	BBY7SOP-00015	BCMOE BCLM Oct2013 m
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	2	N/A	2019/10/04	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	2	N/A	2019/10/04	BBY7SOP-00002	EPA 6020b R2 m
Ammonia-N (Total) (1)	2	N/A	2019/10/07	AB SOP-00007	SM 23 4500 NH3 A G m
Nitrate + Nitrite (N) (highlevel)	3	N/A	2019/10/03	BBY6SOP-00010	SM 23 4500-NO3- I m
Nitrite (N) by CFA (highlevel)	3	N/A	2019/10/03	BBY6SOP-00010	SM 23 4500-NO3- I m
Nitrogen - Nitrate (as N)	2	N/A	2019/10/03	BBY WI-00033	Auto Calc
Filter and HNO3 Preserve for Metals	2	N/A	2019/10/02	BBY7 WI-00004	SM 23 3030B m
pH @25°C (2)	3	N/A	2019/10/03	BBY6SOP-00026	SM 22 4500-H+ B m
Orthophosphate by Konelab (3)	2	N/A	2019/10/03	BBY6SOP-00013	SM 23 4500-P E m
Total Sulphide (1)	2	N/A	2019/10/07	AB SOP-00080	SM 23 4500 S2-A D Fm
Total Dissolved Solids (Filt. Residue)	1	2019/10/03	2019/10/05	BBY6SOP-00033	SM 23 2540 C m
Total Dissolved Solids (Filt. Residue)	1	2019/10/04	2019/10/05	BBY6SOP-00033	SM 23 2540 C m
VOCs, VH, F1, LH in Water by HS GC/MS	1	N/A	2019/10/05	BBY8SOP-00009 / BBY8SOP-00011 / BBY8SOP-00012	BCMOE BCLM Jul2017 m
Volatile HC-BTEX (4)	1	N/A	2019/10/07	BBY WI-00033	Auto Calc

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been

Your P.O. #: 73506780-4
Your Project #: 88877-11-07
Site#: 88877-11-07
Site Location: 7295 GOLD RIVER HIGHWAY
Your C.O.C. #: 591106-01-01

Attention: Rose Marie Rocca

GHD Limited
10271 Shellbridge Way
Suite 165
Richmond, BC
Canada V6X 2W8

Report Date: 2019/10/08
Report #: R2793484
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: B984003
Received: 2019/10/01, 12:05

accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by BV Labs Calgary Environmental
(2) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Bureau Veritas Laboratories endeavours to analyze samples as soon as possible after receipt.
(3) Orthophosphate > Total Phosphorus Imbalance: When applicable, Orthophosphate, Total Phosphorus and dissolved Phosphorus results were reviewed and data quality meets acceptable levels unless otherwise noted.
(4) VPH = VH - (Benzene + Toluene + Ethylbenzene + m & p-Xylene + o-Xylene + Styrene)

Encryption Key

Namita Sahni
Burnaby Project Manager
08 Oct 2019 17:20:23

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Parminder Virk, Key Account Specialist
Email: Parminder.Virk@bvlabs.com
Phone# (403)735-2235

==========

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Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

BV Labs Job #: B984003
Report Date: 2019/10/08

GHD Limited
Client Project #: 88877-11-07
Site Location: 7295 GOLD RIVER HIGHWAY
Your P.O. #: 73506780-4
Sampler Initials: RP

RESULTS OF CHEMICAL ANALYSES OF GROUND WATER

BV Labs ID		WP7389			WP7390		
Sampling Date		2019/09/30 14:20			2019/09/30 16:00		
COC Number		591106-01-01			591106-01-01		
	UNITS	WG-088877-300919-RP-01	RDL	QC Batch	WG-088877-300919-RP-02	RDL	QC Batch
ANIONS							
Nitrite (N)	mg/L	<0.10	0.10	9614030	<0.10	0.10	9614030
Calculated Parameters							
Filter and HNO3 Preservation	N/A	FIELD	N/A	ONSITE	FIELD	N/A	ONSITE
Nitrate (N)	mg/L	1.01	0.10	9611995	0.38	0.10	9611995
Sulphide (as H2S)	mg/L	<0.019	0.019	9611734	<0.0020	0.0020	9611734
Misc. Inorganics							
Conductivity	uS/cm	530	2.0	9613859	150	2.0	9613866
pH	pH	7.82	N/A	9613861	7.08	N/A	9613864
Total Dissolved Solids	mg/L	320	10	9615132	90	10	9614274
Anions							
Alkalinity (PP as CaCO3)	mg/L	<1.0	1.0	9613858	<1.0	1.0	9613867
Alkalinity (Total as CaCO3)	mg/L	280	1.0	9613858	64	1.0	9613867
Bicarbonate (HCO3)	mg/L	340	1.0	9613858	78	1.0	9613867
Carbonate (CO3)	mg/L	<1.0	1.0	9613858	<1.0	1.0	9613867
Hydroxide (OH)	mg/L	<1.0	1.0	9613858	<1.0	1.0	9613867
Total Sulphide	mg/L	<0.018 (1)	0.018	9617226	<0.0018	0.0018	9617226
Dissolved Chloride (Cl)	mg/L	2.4	1.0	9615475	5.9	1.0	9615475
Dissolved Sulphate (SO4)	mg/L	8.9	1.0	9615475	7.3	1.0	9615475
Nutrients							
Total Ammonia (N)	mg/L	0.029	0.015	9617709	0.023	0.015	9617678
Orthophosphate (P)	mg/L	0.0093	0.0030	9614457	0.014	0.0030	9614457
Nitrate plus Nitrite (N)	mg/L	1.01	0.10	9614029	0.38	0.10	9614029

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.
Matrix spike exceeds acceptance limits due to probable matrix interference.

Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

BV Labs Job #: B984003
Report Date: 2019/10/08

GHD Limited
Client Project #: 88877-11-07
Site Location: 7295 GOLD RIVER HIGHWAY
Your P.O. #: 73506780-4
Sampler Initials: RP

RESULTS OF CHEMICAL ANALYSES OF GROUND WATER

BV Labs ID		WP7390		WP7391		
Sampling Date		2019/09/30 16:00		2019/09/30 16:05		
COC Number		591106-01-01		591106-01-01		
	UNITS	WG-088877-300919-RP-02 Lab-Dup	QC Batch	WG-088877-300919-RP-03	RDL	QC Batch
ANIONS						
Nitrite (N)	mg/L	<0.10	9614030	<0.10	0.10	9614030
Misc. Inorganics						
Conductivity	uS/cm	N/A	9613866	150	2.0	9613859
pH	pH	N/A	9613864	7.12	N/A	9613861
Total Dissolved Solids	mg/L	86	9614274	N/A	10	N/A
Anions						
Alkalinity (PP as CaCO3)	mg/L	N/A	9613867	<1.0	1.0	9613858
Alkalinity (Total as CaCO3)	mg/L	N/A	9613867	65	1.0	9613858
Bicarbonate (HCO3)	mg/L	N/A	9613867	79	1.0	9613858
Carbonate (CO3)	mg/L	N/A	9613867	<1.0	1.0	9613858
Hydroxide (OH)	mg/L	N/A	9613867	<1.0	1.0	9613858
Total Sulphide	mg/L	<0.0018	9617226	N/A	0.0018	N/A
Nutrients						
Total Ammonia (N)	mg/L	0.023	9617678	N/A	0.015	N/A
Orthophosphate (P)	mg/L	0.014	9614457	N/A	0.0030	N/A
Nitrate plus Nitrite (N)	mg/L	0.38	9614029	0.38	0.10	9614029

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

BV Labs Job #: B984003
Report Date: 2019/10/08

GHD Limited
Client Project #: 88877-11-07
Site Location: 7295 GOLD RIVER HIGHWAY
Your P.O. #: 73506780-4
Sampler Initials: RP

CSR DISSOLVED METALS IN WATER WITH CV HG (GROUND WATER)

BV Labs ID		WP7389	WP7390		
Sampling Date		2019/09/30 14:20	2019/09/30 16:00		
COC Number		591106-01-01	591106-01-01		
	UNITS	WG-088877-300919-RP-01	WG-088877-300919-RP-02	RDL	QC Batch
Calculated Parameters					
Dissolved Hardness (CaCO3)	mg/L	258	61.3	0.50	9611420
Elements					
Dissolved Mercury (Hg)	ug/L	<0.0020	<0.0020	0.0020	9613256
Dissolved Metals by ICPMS					
Dissolved Aluminum (Al)	ug/L	<3.0	6.9	3.0	9613461
Dissolved Antimony (Sb)	ug/L	<0.50	<0.50	0.50	9613461
Dissolved Arsenic (As)	ug/L	0.32	0.40	0.10	9613461
Dissolved Barium (Ba)	ug/L	24.3	3.8	1.0	9613461
Dissolved Beryllium (Be)	ug/L	<0.10	<0.10	0.10	9613461
Dissolved Bismuth (Bi)	ug/L	<1.0	<1.0	1.0	9613461
Dissolved Boron (B)	ug/L	<50	<50	50	9613461
Dissolved Cadmium (Cd)	ug/L	<0.010	<0.010	0.010	9613461
Dissolved Chromium (Cr)	ug/L	1.2	1.6	1.0	9613461
Dissolved Cobalt (Co)	ug/L	<0.20	<0.20	0.20	9613461
Dissolved Copper (Cu)	ug/L	0.51	<0.20	0.20	9613461
Dissolved Iron (Fe)	ug/L	<5.0	<5.0	5.0	9613461
Dissolved Lead (Pb)	ug/L	<0.20	<0.20	0.20	9613461
Dissolved Lithium (Li)	ug/L	<2.0	<2.0	2.0	9613461
Dissolved Manganese (Mn)	ug/L	18.7	<1.0	1.0	9613461
Dissolved Molybdenum (Mo)	ug/L	<1.0	<1.0	1.0	9613461
Dissolved Nickel (Ni)	ug/L	<1.0	<1.0	1.0	9613461
Dissolved Selenium (Se)	ug/L	0.27	0.24	0.10	9613461
Dissolved Silicon (Si)	ug/L	9340	5230	100	9613461
Dissolved Silver (Ag)	ug/L	<0.020	<0.020	0.020	9613461
Dissolved Strontium (Sr)	ug/L	148	28.0	1.0	9613461
Dissolved Thallium (Tl)	ug/L	<0.010	<0.010	0.010	9613461
Dissolved Tin (Sn)	ug/L	<5.0	<5.0	5.0	9613461
Dissolved Titanium (Ti)	ug/L	<5.0	<5.0	5.0	9613461
Dissolved Uranium (U)	ug/L	0.45	<0.10	0.10	9613461
Dissolved Vanadium (V)	ug/L	<5.0	<5.0	5.0	9613461
Dissolved Zinc (Zn)	ug/L	<5.0	<5.0	5.0	9613461
RDL = Reportable Detection Limit					

Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

BV Labs Job #: B984003
Report Date: 2019/10/08

GHD Limited
Client Project #: 88877-11-07
Site Location: 7295 GOLD RIVER HIGHWAY
Your P.O. #: 73506780-4
Sampler Initials: RP

CSR DISSOLVED METALS IN WATER WITH CV HG (GROUND WATER)

BV Labs ID		WP7389	WP7390		
Sampling Date		2019/09/30 14:20	2019/09/30 16:00		
COC Number		591106-01-01	591106-01-01		
	UNITS	WG-088877-300919-RP-01	WG-088877-300919-RP-02	RDL	QC Batch
Dissolved Zirconium (Zr)	ug/L	<0.10	<0.10	0.10	9613461
Dissolved Calcium (Ca)	mg/L	81.8	19.5	0.050	9612082
Dissolved Magnesium (Mg)	mg/L	13.0	3.03	0.050	9612082
Dissolved Potassium (K)	mg/L	0.746	0.344	0.050	9612082
Dissolved Sodium (Na)	mg/L	12.9	6.64	0.050	9612082
Dissolved Sulphur (S)	mg/L	<3.0	<3.0	3.0	9612082
RDL = Reportable Detection Limit					

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BV Labs Job #: B984003
Report Date: 2019/10/08

GHD Limited
Client Project #: 88877-11-07
Site Location: 7295 GOLD RIVER HIGHWAY
Your P.O. #: 73506780-4
Sampler Initials: RP

CSR VOC + VPH IN WATER (GROUND WATER)

BV Labs ID		WP7389		
Sampling Date		2019/09/30 14:20		
COC Number		591106-01-01		
	UNITS	WG-088877-300919-RP-01	RDL	QC Batch
Calculated Parameters				
VPH (VHW6 to 10 - BTEX)	ug/L	<300	300	9611914
Volatiles				
VH C6-C10	ug/L	<300	300	9615070
1,1,1,2-tetrachloroethane	ug/L	<0.50	0.50	9615070
1,1,1-trichloroethane	ug/L	<0.50	0.50	9615070
1,1,2,2-tetrachloroethane	ug/L	<0.50	0.50	9615070
1,1,2Trichloro-1,2,2Trifluoroethane	ug/L	<2.0	2.0	9615070
1,1,2-trichloroethane	ug/L	<0.50	0.50	9615070
1,1-dichloroethane	ug/L	<0.50	0.50	9615070
1,1-dichloroethene	ug/L	<0.50	0.50	9615070
1,2,3-trichlorobenzene	ug/L	<2.0	2.0	9615070
1,2,4-trichlorobenzene	ug/L	<2.0	2.0	9615070
1,2-dibromoethane	ug/L	<0.20	0.20	9615070
1,2-dichlorobenzene	ug/L	<0.50	0.50	9615070
1,2-dichloroethane	ug/L	<0.50	0.50	9615070
1,2-dichloropropane	ug/L	<0.50	0.50	9615070
1,3,5-trimethylbenzene	ug/L	<2.0	2.0	9615070
1,3-Butadiene	ug/L	<0.50	0.50	9615070
1,3-dichlorobenzene	ug/L	<0.50	0.50	9615070
1,3-dichloropropane	ug/L	<1.0	1.0	9615070
1,4-dichlorobenzene	ug/L	<0.50	0.50	9615070
Benzene	ug/L	<0.40	0.40	9615070
Bromobenzene	ug/L	<2.0	2.0	9615070
Bromodichloromethane	ug/L	<1.0	1.0	9615070
Bromoform	ug/L	<1.0	1.0	9615070
Bromomethane	ug/L	<1.0	1.0	9615070
Carbon tetrachloride	ug/L	<0.50	0.50	9615070
Chlorobenzene	ug/L	<0.50	0.50	9615070
Chlorodibromomethane	ug/L	<1.0	1.0	9615070
Chloroethane	ug/L	<1.0	1.0	9615070
Chloroform	ug/L	<1.0	1.0	9615070
RDL = Reportable Detection Limit				

BV Labs Job #: B984003
Report Date: 2019/10/08

GHD Limited
Client Project #: 88877-11-07
Site Location: 7295 GOLD RIVER HIGHWAY
Your P.O. #: 73506780-4
Sampler Initials: RP

CSR VOC + VPH IN WATER (GROUND WATER)

BV Labs ID		WP7389		
Sampling Date		2019/09/30 14:20		
COC Number		591106-01-01		
	UNITS	WG-088877-300919-RP-01	RDL	QC Batch
Chloromethane	ug/L	<1.0	1.0	9615070
cis-1,2-dichloroethene	ug/L	<1.0	1.0	9615070
cis-1,3-dichloropropene	ug/L	<1.0	1.0	9615070
Dichlorodifluoromethane	ug/L	<2.0	2.0	9615070
Dichloromethane	ug/L	<2.0	2.0	9615070
Ethylbenzene	ug/L	<0.40	0.40	9615070
Hexachlorobutadiene	ug/L	<0.50	0.50	9615070
Isopropylbenzene	ug/L	<2.0	2.0	9615070
Methyl-tert-butylether (MTBE)	ug/L	<4.0	4.0	9615070
Styrene	ug/L	<0.50	0.50	9615070
Tetrachloroethene	ug/L	<0.50	0.50	9615070
Toluene	ug/L	<0.40	0.40	9615070
trans-1,2-dichloroethene	ug/L	<1.0	1.0	9615070
trans-1,3-dichloropropene	ug/L	<1.0	1.0	9615070
Trichloroethene	ug/L	<0.50	0.50	9615070
Trichlorofluoromethane	ug/L	<4.0	4.0	9615070
Vinyl chloride	ug/L	<0.50	0.50	9615070
m & p-Xylene	ug/L	<0.40	0.40	9615070
o-Xylene	ug/L	<0.40	0.40	9615070
Xylenes (Total)	ug/L	<0.40	0.40	9615070
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	101	N/A	9615070
4-Bromofluorobenzene (sur.)	%	90	N/A	9615070
D4-1,2-Dichloroethane (sur.)	%	102	N/A	9615070

RDL = Reportable Detection Limit
N/A = Not Applicable

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BV Labs Job #: B984003
Report Date: 2019/10/08

GHD Limited
Client Project #: 88877-11-07
Site Location: 7295 GOLD RIVER HIGHWAY
Your P.O. #: 73506780-4
Sampler Initials: RP

GENERAL COMMENTS

Change request: Some requests (TDS/Sulphide/PO4/NH4/D.Metals/Hg/Cl/SO4) cancelled for Sample WG-088877-3001919-RP-03 as per Rimi Plaha on 2019/10/03.

Results relate only to the items tested.

Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

BV Labs Job #: B984003
Report Date: 2019/10/08

QUALITY ASSURANCE REPORT

GHD Limited
Client Project #: 88877-11-07
Site Location: 7295 GOLD RIVER HIGHWAY
Your P.O. #: 73506780-4
Sampler Initials: RP

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9615070	1,4-Difluorobenzene (sur.)	2019/10/05	100	50 - 140	100	50 - 140	99	%		
9615070	4-Bromofluorobenzene (sur.)	2019/10/05	106	50 - 140	104	50 - 140	94	%		
9615070	D4-1,2-Dichloroethane (sur.)	2019/10/05	109	50 - 140	108	50 - 140	106	%		
9613256	Dissolved Mercury (Hg)	2019/10/03	107 (1)	80 - 120	107	80 - 120	<0.0020	ug/L	NC (2)	20
9613461	Dissolved Aluminum (Al)	2019/10/03	98	80 - 120	100	80 - 120	<3.0	ug/L		
9613461	Dissolved Antimony (Sb)	2019/10/03	100	80 - 120	100	80 - 120	<0.50	ug/L		
9613461	Dissolved Arsenic (As)	2019/10/03	105	80 - 120	100	80 - 120	<0.10	ug/L		
9613461	Dissolved Barium (Ba)	2019/10/03	NC	80 - 120	104	80 - 120	<1.0	ug/L		
9613461	Dissolved Beryllium (Be)	2019/10/03	98	80 - 120	97	80 - 120	<0.10	ug/L		
9613461	Dissolved Bismuth (Bi)	2019/10/03	99	80 - 120	103	80 - 120	<1.0	ug/L		
9613461	Dissolved Boron (B)	2019/10/03	91	80 - 120	94	80 - 120	<50	ug/L		
9613461	Dissolved Cadmium (Cd)	2019/10/03	102	80 - 120	102	80 - 120	<0.010	ug/L		
9613461	Dissolved Chromium (Cr)	2019/10/03	99	80 - 120	101	80 - 120	<1.0	ug/L		
9613461	Dissolved Cobalt (Co)	2019/10/03	94	80 - 120	99	80 - 120	<0.20	ug/L		
9613461	Dissolved Copper (Cu)	2019/10/03	94	80 - 120	101	80 - 120	<0.20	ug/L		
9613461	Dissolved Iron (Fe)	2019/10/03	102	80 - 120	100	80 - 120	<5.0	ug/L		
9613461	Dissolved Lead (Pb)	2019/10/03	105	80 - 120	105	80 - 120	<0.20	ug/L		
9613461	Dissolved Lithium (Li)	2019/10/03	97	80 - 120	101	80 - 120	<2.0	ug/L		
9613461	Dissolved Manganese (Mn)	2019/10/03	101	80 - 120	106	80 - 120	<1.0	ug/L		
9613461	Dissolved Molybdenum (Mo)	2019/10/03	104	80 - 120	101	80 - 120	<1.0	ug/L		
9613461	Dissolved Nickel (Ni)	2019/10/03	99	80 - 120	106	80 - 120	<1.0	ug/L		
9613461	Dissolved Selenium (Se)	2019/10/03	103	80 - 120	101	80 - 120	<0.10	ug/L		
9613461	Dissolved Silicon (Si)	2019/10/03	NC	80 - 120	95	80 - 120	<100	ug/L		
9613461	Dissolved Silver (Ag)	2019/10/03	100	80 - 120	102	80 - 120	<0.020	ug/L		
9613461	Dissolved Strontium (Sr)	2019/10/03	NC	80 - 120	99	80 - 120	<1.0	ug/L		
9613461	Dissolved Thallium (Tl)	2019/10/03	101	80 - 120	103	80 - 120	<0.010	ug/L		
9613461	Dissolved Tin (Sn)	2019/10/03	94	80 - 120	93	80 - 120	<5.0	ug/L		
9613461	Dissolved Titanium (Ti)	2019/10/03	103	80 - 120	107	80 - 120	<5.0	ug/L		
9613461	Dissolved Uranium (U)	2019/10/03	105	80 - 120	105	80 - 120	<0.10	ug/L		
9613461	Dissolved Vanadium (V)	2019/10/03	103	80 - 120	104	80 - 120	<5.0	ug/L		
9613461	Dissolved Zinc (Zn)	2019/10/03	103	80 - 120	105	80 - 120	<5.0	ug/L		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9613461	Dissolved Zirconium (Zr)	2019/10/03	104	80 - 120	99	80 - 120	<0.10	ug/L		
9613858	Alkalinity (PP as CaCO3)	2019/10/03					<1.0	mg/L	NC (2)	20
9613858	Alkalinity (Total as CaCO3)	2019/10/03	105	80 - 120	96	80 - 120	<1.0	mg/L	1.6 (2)	20
9613858	Bicarbonate (HCO3)	2019/10/03					<1.0	mg/L	1.6 (2)	20
9613858	Carbonate (CO3)	2019/10/03					<1.0	mg/L	NC (2)	20
9613858	Hydroxide (OH)	2019/10/03					<1.0	mg/L	NC (2)	20
9613859	Conductivity	2019/10/03			100	80 - 120	<2.0	uS/cm		
9613861	pH	2019/10/03			101	97 - 103			0.99 (2)	N/A
9613864	pH	2019/10/03			101	97 - 103				
9613866	Conductivity	2019/10/03			99	80 - 120	<2.0	uS/cm		
9613867	Alkalinity (PP as CaCO3)	2019/10/03					<1.0	mg/L	NC (2)	20
9613867	Alkalinity (Total as CaCO3)	2019/10/03	NC	80 - 120	94	80 - 120	<1.0	mg/L	0.91 (2)	20
9613867	Bicarbonate (HCO3)	2019/10/03					<1.0	mg/L	0.91 (2)	20
9613867	Carbonate (CO3)	2019/10/03					<1.0	mg/L	NC (2)	20
9613867	Hydroxide (OH)	2019/10/03					<1.0	mg/L	NC (2)	20
9614029	Nitrate plus Nitrite (N)	2019/10/03	105 (3)	80 - 120	107	80 - 120	<0.10	mg/L	0.40 (4)	25
9614030	Nitrite (N)	2019/10/03	96 (3)	80 - 120	95	80 - 120	<0.10	mg/L	NC (4)	20
9614274	Total Dissolved Solids	2019/10/05	103	80 - 120	100	80 - 120	<10	mg/L	4.5 (4)	20
9614457	Orthophosphate (P)	2019/10/03	92 (3)	80 - 120	101	80 - 120	<0.0030	mg/L	1.1 (4)	20
9615070	1,1,1,2-tetrachloroethane	2019/10/05	104	50 - 140	99	60 - 130	<0.50	ug/L	NC (2)	30
9615070	1,1,1-trichloroethane	2019/10/05	103	50 - 140	96	60 - 130	<0.50	ug/L	NC (2)	30
9615070	1,1,2,2-tetrachloroethane	2019/10/05	102	50 - 140	97	60 - 130	<0.50	ug/L	NC (2)	30
9615070	1,1,2Trichloro-1,2,2Trifluoroethane	2019/10/05	108	50 - 140	103	60 - 130	<2.0	ug/L	NC (2)	30
9615070	1,1,2-trichloroethane	2019/10/05	111	50 - 140	105	60 - 130	<0.50	ug/L	NC (2)	30
9615070	1,1-dichloroethane	2019/10/05	104	50 - 140	98	60 - 130	<0.50	ug/L	NC (2)	30
9615070	1,1-dichloroethene	2019/10/05	114	50 - 140	110	60 - 130	<0.50	ug/L	NC (2)	30
9615070	1,2,3-trichlorobenzene	2019/10/05	113	50 - 140	109	60 - 130	<2.0	ug/L	NC (2)	30
9615070	1,2,4-trichlorobenzene	2019/10/05	110	50 - 140	107	60 - 130	<2.0	ug/L	NC (2)	30
9615070	1,2-dibromoethane	2019/10/05	109	50 - 140	104	60 - 130	<0.20	ug/L	NC (2)	30
9615070	1,2-dichlorobenzene	2019/10/05	110	50 - 140	106	60 - 130	<0.50	ug/L	NC (2)	30
9615070	1,2-dichloroethane	2019/10/05	93	50 - 140	87	60 - 130	<0.50	ug/L	NC (2)	30

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9615070	1,2-dichloropropane	2019/10/05	107	50 - 140	99	60 - 130	<0.50	ug/L	NC (2)	30
9615070	1,3,5-trimethylbenzene	2019/10/05	113	50 - 140	108	60 - 130	<2.0	ug/L	NC (2)	30
9615070	1,3-Butadiene	2019/10/05	122	50 - 140	112	50 - 140	<0.50	ug/L	NC (2)	30
9615070	1,3-dichlorobenzene	2019/10/05	111	50 - 140	107	60 - 130	<0.50	ug/L	NC (2)	30
9615070	1,3-dichloropropane	2019/10/05	110	50 - 140	104	60 - 130	<1.0	ug/L	NC (2)	30
9615070	1,4-dichlorobenzene	2019/10/05	101	50 - 140	98	60 - 130	<0.50	ug/L	NC (2)	30
9615070	Benzene	2019/10/05	104	50 - 140	98	60 - 130	<0.40	ug/L	NC (2)	30
9615070	Bromobenzene	2019/10/05	107	50 - 140	101	60 - 130	<2.0	ug/L	NC (2)	30
9615070	Bromodichloromethane	2019/10/05	103	50 - 140	96	60 - 130	<1.0	ug/L	NC (2)	30
9615070	Bromoform	2019/10/05	100	50 - 140	93	60 - 130	<1.0	ug/L	NC (2)	30
9615070	Bromomethane	2019/10/05	107	50 - 140	102	50 - 140	<1.0	ug/L	NC (2)	30
9615070	Carbon tetrachloride	2019/10/05	103	50 - 140	96	60 - 130	<0.50	ug/L	NC (2)	30
9615070	Chlorobenzene	2019/10/05	103	50 - 140	99	60 - 130	<0.50	ug/L	NC (2)	30
9615070	Chlorodibromomethane	2019/10/05	109	50 - 140	103	60 - 130	<1.0	ug/L	NC (2)	30
9615070	Chloroethane	2019/10/05	82	50 - 140	80	60 - 130	<1.0	ug/L	NC (2)	30
9615070	Chloroform	2019/10/05	103	50 - 140	98	60 - 130	<1.0	ug/L	NC (2)	30
9615070	Chloromethane	2019/10/05	122	50 - 140	120	50 - 140	<1.0	ug/L	NC (2)	30
9615070	cis-1,2-dichloroethene	2019/10/05	104	50 - 140	98	60 - 130	<1.0	ug/L	NC (2)	30
9615070	cis-1,3-dichloropropene	2019/10/05	99	50 - 140	96	50 - 140	<1.0	ug/L	NC (2)	30
9615070	Dichlorodifluoromethane	2019/10/05	132	50 - 140	140	50 - 140	<2.0	ug/L	NC (2)	30
9615070	Dichloromethane	2019/10/05	102	50 - 140	95	60 - 130	<2.0	ug/L	NC (2)	30
9615070	Ethylbenzene	2019/10/05	113	50 - 140	108	60 - 130	<0.40	ug/L	NC (2)	30
9615070	Hexachlorobutadiene	2019/10/05	104	50 - 140	101	60 - 130	<0.50	ug/L	NC (2)	30
9615070	Isopropylbenzene	2019/10/05	115	50 - 140	108	60 - 130	<2.0	ug/L	NC (2)	30
9615070	m & p-Xylene	2019/10/05	123	50 - 140	119	60 - 130	<0.40	ug/L	NC (2)	30
9615070	Methyl-tert-butylether (MTBE)	2019/10/05	102	50 - 140	95	60 - 130	<4.0	ug/L	NC (2)	30
9615070	o-Xylene	2019/10/05	118	50 - 140	113	60 - 130	<0.40	ug/L	NC (2)	30
9615070	Styrene	2019/10/05	107	50 - 140	98	60 - 130	<0.50	ug/L	NC (2)	30
9615070	Tetrachloroethene	2019/10/05	101	50 - 140	98	60 - 130	<0.50	ug/L	NC (2)	30
9615070	Toluene	2019/10/05	111	50 - 140	109	60 - 130	<0.40	ug/L	NC (2)	30
9615070	trans-1,2-dichloroethene	2019/10/05	104	50 - 140	101	60 - 130	<1.0	ug/L	NC (2)	30

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9615070	trans-1,3-dichloropropene	2019/10/05	111	50 - 140	102	50 - 140	<1.0	ug/L	NC (2)	30
9615070	Trichloroethene	2019/10/05	98	50 - 140	94	60 - 130	<0.50	ug/L	NC (2)	30
9615070	Trichlorofluoromethane	2019/10/05	106	50 - 140	82	60 - 130	<4.0	ug/L	NC (2)	30
9615070	VH C6-C10	2019/10/05			92	70 - 130	<300	ug/L	NC (2)	30
9615070	Vinyl chloride	2019/10/05	107	50 - 140	107	50 - 140	<0.50	ug/L	11 (2)	30
9615070	Xylenes (Total)	2019/10/05					<0.40	ug/L	NC (2)	30
9615132	Total Dissolved Solids	2019/10/05	103	80 - 120	97	80 - 120	<10	mg/L	6.5 (2)	20
9615475	Dissolved Chloride (Cl)	2019/10/03	94	80 - 120	98	80 - 120	<1.0	mg/L		
9615475	Dissolved Sulphate (SO4)	2019/10/03	NC	80 - 120	95	80 - 120	<1.0	mg/L	3.5 (2)	20
9617226	Total Sulphide	2019/10/07	NC (5)	80 - 120	100	80 - 120	<0.0018	mg/L	NC (6)	20
9617678	Total Ammonia (N)	2019/10/07	96 (7)	80 - 120	96	80 - 120	<0.015	mg/L	1.2 (8)	20
9617709	Total Ammonia (N)	2019/10/07	94	80 - 120	94	80 - 120	<0.015	mg/L	0.60 (2)	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Matrix Spike Parent ID [WP7390-05]

(2) Duplicate Parent ID

(3) Matrix Spike Parent ID [WP7390-01]

(4) Duplicate Parent ID [WP7390-01]

(5) Matrix Spike Parent ID [WP7389-07]

(6) Duplicate Parent ID [WP7390-07]

(7) Matrix Spike Parent ID [WP7390-06]

(8) Duplicate Parent ID [WP7390-06]

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BV Labs Job #: B984003
Report Date: 2019/10/08

GHD Limited
Client Project #: 88877-11-07
Site Location: 7295 GOLD RIVER HIGHWAY
Your P.O. #: 73506780-4
Sampler Initials: RP

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Andy Lu, Ph.D., P.Chem., Scientific Specialist

Ghayasuddin Khan, M.Sc., P.Chem., QP, Scientific Specialist, Inorganics

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports.
For Service Group specific validation please refer to the Validation Signature Page.

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Bureau Veritas Laboratories
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B984003_COC

Bottle Order #: 591106

Chain Of Custody Record: C#591106-01-01

Project Manager: Parminder Virk

INVOICE TO:		Report Information		Project Information	
Company Name	#163 GHD Limited	Company Name	#28639 GHD Limited	Quotation #	B80076
Contact Name	Accounts Payable	Contact Name	Rose Marie Rocca	P.O. #	73506780-4
Address	651 COLBY DRIVE WATERLOO ON N2V 1C2	Address	10271 Shellbridge Way Suite 165 Richmond BC V6X 2W8	Project #	088877-11-07
Phone	(519) 884-0510 Fax: (519) 725-1394	Phone	(604) 214-0510 Ext: 234 Fax:	Project Name	
Email		Email	rrocca@craworld.com; laura.ermeta@ghd.com;	Site #	
				Sampled By	RPlaha

Regulatory Criteria: CSR / CCME / BC Water Quality / Other

Special Instructions

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BV LABS

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals Field Filtered ? (Y / N)	Alk,EC,pH,TDS,Cl,SO4,Ammonia,NO2,NO3,N+N,PO4,LLsulfide,D metals, D Hg	VOC	Alk,EC,pH,TDS,Cl,TSS,SO4,Ammonia,NO2,NO3,N+N,TKN,PO4,LLsulfide,T.metals,T.Hg+P	BOD, COD	CSR/CCME Tot. Metals including Phosphorus w/ CV Hg, Dissolved hardness						# of Bottles	Comments
1	WG-088877-300919-RP01		Sept. 30, 2019	1420	W		X	X									9	Note: short hold times
2	↓	-RP-02	↓	1600	W		X										7	↓
3	↓	-RP-03	↓	1605	W		X										7	
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Turnaround Time (TAT) Required

Please provide advance notice for rush projects

Regular (Standard) TAT: [X]
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
1 DAY ☐ 2 Day ☐ 3 Day ☐ Date Required: ____ ☐
Rush Confirmation Number: ____ (call lab for #)

RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
RPlaha	19/10/01	7:30AM	Michelle Wong	19/10/01	12:05	
M. Chillimich	19/10/01	15:00	DHDeJunwoke	2019/10/02	8:30	

Lab Use Only: Time Sensitive ☐ Temperature (°C) on Receipt: 4, 0, 0 / 1, 5, 4 Custody Seal Intact on Cooler? N/A Yes ☐ No ☐

ICE: YES

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BV LABS' STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVLABS.COM/TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: BV Labs Yellow: Client

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Bureau Veritas Canada (2019) Inc.

Your P.O. #: 73506780-04
Your Project #: 088877-11-07
Site#: 088877-11-07
Site Location: UPLAND
Your C.O.C. #: G132876

Attention: Rose Marie Rocca

GHD Limited
10271 Shellbridge Way
Suite 165
Richmond, BC
Canada V6X 2W8

Report Date: 2020/03/11
Report #: R2856691
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BV LABS JOB #: B984674
Received: 2019/10/03, 09:31

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	3	N/A	2019/10/08	BBY6SOP-00026	SM 23 2320 B m
Biochemical Oxygen Demand	3	2019/10/04	2019/10/09	BBY6SOP-00045	SM 23 5210 B m
BTEX/MTBE LH, VH, F1 SIM/MS	1	N/A	2019/10/05	BBY8SOP-00010 / BBY8SOP-00011 / BBY8SOP-00012	BCMOE BCLM Jul 2017
BTEX/MTBE LH, VH, F1 SIM/MS	3	N/A	2019/10/07	BBY8SOP-00010 / BBY8SOP-00011 / BBY8SOP-00012	BCMOE BCLM Jul 2017
Chloride/Sulphate by Auto Colourimetry	3	N/A	2019/10/04	BBY6SOP-00011 / BBY6SOP-00017	SM23-4500-Cl/SO4-E m
COD by Colorimeter	3	N/A	2019/10/08	BBY6SOP-00024	SM 23 5220 D m
Conductivity @25C	3	N/A	2019/10/08	BBY6SOP-00026	SM 23 2510 B m
Sulphide (as H2S) (1)	3	N/A	2019/10/07		Auto Calc
Hardness Total (calculated as CaCO3) (3)	3	N/A	2019/10/09	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	3	N/A	2019/10/05	BBY WI-00033	Auto Calc
Mercury (Dissolved) by CV	2	2019/10/11	2019/10/11	BBY7SOP-00015	BCMOE BCLM Oct2013 m
Mercury (Total) by CV	1	2019/10/07	2019/10/07	BBY7SOP-00015	BCMOE BCLM Oct2013 m
Mercury (Total) by CV	2	2019/10/10	2019/10/11	BBY7SOP-00015	BCMOE BCLM Oct2013 m
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	3	N/A	2019/10/05	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	3	N/A	2019/10/05	BBY7SOP-00002	EPA 6020b R2 m
Na, K, Ca, Mg, S by CRC ICPMS (total)	3	2019/10/04	2019/10/09	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (total)	3	2019/10/08	2019/10/09	BBY7SOP-00003 / BBY7SOP-00002	EPA 6020b R2 m
Ammonia-N (Total) (2)	3	N/A	2019/10/08	AB SOP-00007	SM 23 4500 NH3 A G m
Nitrate + Nitrite (N) (highlevel)	3	N/A	2019/10/04	BBY6SOP-00010	SM 23 4500-NO3- I m
Nitrite (N) by CFA (highlevel)	3	N/A	2019/10/04	BBY6SOP-00010	SM 23 4500-NO3- I m
Nitrogen - Nitrate (as N)	3	N/A	2019/10/04	BBY WI-00033	Auto Calc
PAH in Water by GC/MS (SIM)	3	2019/10/04	2019/10/06	BBY8SOP-00021	BCMOE BCLM Jul2017m
Total LMW, HMW, Total PAH Calc (4)	3	N/A	2019/10/07	BBY WI-00033	Auto Calc
Filter and HNO3 Preserve for Metals	3	N/A	2019/10/04	BBY7 WI-00004	SM 23 3030B m
pH @25°C (5)	3	N/A	2019/10/08	BBY6SOP-00026	SM 23 4500-H+ B m
Orthophosphate by Konelab (6)	3	N/A	2019/10/05	BBY6SOP-00013	SM 23 4500-P E m

Your P.O. #: 73506780-04
Your Project #: 088877-11-07
Site#: 088877-11-07
Site Location: UPLAND
Your C.O.C. #: G132876

Attention: Rose Marie Rocca

GHD Limited
10271 Shellbridge Way
Suite 165
Richmond, BC
Canada V6X 2W8

Report Date: 2020/03/11
Report #: R2856691
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BV LABS JOB #: B984674
Received: 2019/10/03, 09:31

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Total Sulphide (1)	3	N/A	2019/10/07	AB SOP-00080	SM 23 4500 S2-A D Fm
Total Dissolved Solids (Filt. Residue)	3	2019/10/08	2019/10/09	BBY6SOP-00033	SM 23 2540 C m
Total Suspended Solids (NFR) (2)	3	2019/10/06	2019/10/06	AB SOP-00061	SM 23 2540 D m
Volatile HC-BTEX (7)	1	N/A	2019/10/05	BBY WI-00033	Auto Calc
Volatile HC-BTEX (7)	3	N/A	2019/10/08	BBY WI-00033	Auto Calc

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by BV Labs Edmonton Environmental
(2) This test was performed by BV Labs Calgary Environmental
(3) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).
(4) Total PAHs in Water include: Quinoline, Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Acridine, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b&j)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, and Benzo(g,h,i)perylene.
(5) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are

Your P.O. #: 73506780-04
Your Project #: 088877-11-07
Site#: 088877-11-07
Site Location: UPLAND
Your C.O.C. #: G132876

Attention: Rose Marie Rocca

GHD Limited
10271 Shellbridge Way
Suite 165
Richmond, BC
Canada V6X 2W8

Report Date: 2020/03/11
Report #: R2856691
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BV LABS JOB #: B984674

Received: 2019/10/03, 09:31

reported past the CCME holding time. Bureau Veritas Laboratories endeavours to analyze samples as soon as possible after receipt.
(6) Orthophosphate > Total Phosphorus Imbalance: When applicable, Orthophosphate, Total Phosphorus and dissolved Phosphorus results were reviewed and data quality meets acceptable levels unless otherwise noted.
(7) VPH = VH - (Benzene + Toluene + Ethylbenzene + m & p-Xylene + o-Xylene + Styrene)

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Parminder Virk, Key Account Specialist
Email: Parminder.Virk@bvlabs.com
Phone# (403)735-2235

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BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

BV Labs Job #: B984674
Report Date: 2020/03/11

GHD Limited
Client Project #: 088877-11-07
Site Location: UPLAND
Your P.O. #: 73506780-04
Sampler Initials: RP

RESULTS OF CHEMICAL ANALYSES OF WATER

BV Labs ID		WQ0908		WQ0909	WQ0910		
Sampling Date		2019/10/02 12:20		2019/10/02 13:15	2019/10/02 13:20		
COC Number		G132876		G132876	G132876		
	UNITS	WL-088877-021019-RP-13	RDL	WL-088877-021019-RP-14	WL-088877-021019-RP-15	RDL	QC Batch
ANIONS							
Nitrite (N)	mg/L	<0.10	0.10	<0.10	<0.10	0.10	9616151
Calculated Parameters							
Filter and HNO3 Preservation	N/A	FIELD	N/A	FIELD	FIELD	N/A	ONSITE
Nitrate (N)	mg/L	0.11	0.10	1.04	1.04	0.10	9615249
Sulphide (as H2S)	mg/L	0.034	0.010	<0.0020	<0.0020	0.0020	9615161
Demand Parameters							
Biochemical Oxygen Demand	mg/L	4.2	2.0	<2.0	<2.0	2.0	9615615
Chemical Oxygen Demand	mg/L	105	10	43	46	10	9618004
Misc. Inorganics							
Conductivity	uS/cm	440	2.0	790	790	2.0	9619975
pH	pH	7.38	N/A	8.13	8.13	N/A	9619974
Total Dissolved Solids	mg/L	270	10	500	520	10	9619167
Total Suspended Solids	mg/L	170 (1)	1.9	8.5	11	1.0	9616797
Anions							
Alkalinity (PP as CaCO3)	mg/L	<1.0	1.0	<1.0	<1.0	1.0	9619971
Alkalinity (Total as CaCO3)	mg/L	170	1.0	340	340	1.0	9619971
Bicarbonate (HCO3)	mg/L	210	1.0	420	420	1.0	9619971
Carbonate (CO3)	mg/L	<1.0	1.0	<1.0	<1.0	1.0	9619971
Hydroxide (OH)	mg/L	<1.0	1.0	<1.0	<1.0	1.0	9619971
Total Sulphide	mg/L	0.032 (2)	0.0090	<0.0018	<0.0018	0.0018	9618131
Dissolved Chloride (Cl)	mg/L	17	1.0	13	13	1.0	9617874
Dissolved Sulphate (SO4)	mg/L	29	1.0	69	74	1.0	9617874
Nutrients							
Total Ammonia (N)	mg/L	1.2	0.015	0.32	0.34	0.015	9619205
Orthophosphate (P)	mg/L	0.0031	0.0030	<0.0030	0.063	0.0030	9616637
Nitrate plus Nitrite (N)	mg/L	0.11	0.10	1.04	1.04	0.10	9616150

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Detection limit raised based on sample volume used for analysis.
(2) Detection limits raised due to sample matrix.

Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

BV Labs Job #: B984674
Report Date: 2020/03/11

GHD Limited
Client Project #: 088877-11-07
Site Location: UPLAND
Your P.O. #: 73506780-04
Sampler Initials: RP

RESULTS OF CHEMICAL ANALYSES OF WATER

BV Labs ID		WQ0910		
Sampling Date		2019/10/02 13:20		
COC Number		G132876		
	UNITS	WL-088877-021019-RP-15 Lab-Dup	RDL	QC Batch
Misc. Inorganics				
Total Dissolved Solids	mg/L	520	10	9619167

RDL = Reportable Detection Limit

Lab-Dup = Laboratory Initiated Duplicate

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BV Labs Job #: B984674
Report Date: 2020/03/11

GHD Limited
Client Project #: 088877-11-07
Site Location: UPLAND
Your P.O. #: 73506780-04
Sampler Initials: RP

CSR BTEX/VPH IN WATER (WATER)

BV Labs ID		WQ0908	WQ0909	WQ0910		
Sampling Date		2019/10/02 12:20	2019/10/02 13:15	2019/10/02 13:20		
COC Number		G132876	G132876	G132876		
	UNITS	WL-088877-021019-RP-13	WL-088877-021019-RP-14	WL-088877-021019-RP-15	RDL	QC Batch
Calculated Parameters						
VPH (VHW6 to 10 - BTEX)	ug/L	<300	<300	<300	300	9615611
Volatiles						
Methyl-tert-butylether (MTBE)	ug/L	<4.0	<4.0	<4.0	4.0	9617505
Benzene	ug/L	<0.40	<0.40	<0.40	0.40	9617505
Toluene	ug/L	<0.40	<0.40	<0.40	0.40	9617505
Ethylbenzene	ug/L	<0.40	<0.40	<0.40	0.40	9617505
m & p-Xylene	ug/L	<0.40	<0.40	<0.40	0.40	9617505
o-Xylene	ug/L	<0.40	<0.40	<0.40	0.40	9617505
Styrene	ug/L	<0.40	<0.40	<0.40	0.40	9617505
Xylenes (Total)	ug/L	<0.40	<0.40	<0.40	0.40	9617505
VH C6-C10	ug/L	<300	<300	<300	300	9617505
Surrogate Recovery (%)						
1,4-Difluorobenzene (sur.)	%	99	101	100	N/A	9617505
4-Bromofluorobenzene (sur.)	%	96	98	98	N/A	9617505
D4-1,2-Dichloroethane (sur.)	%	110	98	103	N/A	9617505

RDL = Reportable Detection Limit
N/A = Not Applicable

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BV Labs Job #: B984674
Report Date: 2020/03/11

GHD Limited
Client Project #: 088877-11-07
Site Location: UPLAND
Your P.O. #: 73506780-04
Sampler Initials: RP

CSR BTEX/VPH IN WATER (WATER)

BV Labs ID		WQ0936	WQ0936		
Sampling Date		2019/09/30 16:05	2019/09/30 16:05		
COC Number		G132876	G132876		
	UNITS	WL-088877-300919-RP-04	WL-088877-300919-RP-04 Lab-Dup	RDL	QC Batch
Calculated Parameters					
VPH (VHW6 to 10 - BTEX)	ug/L	<300	N/A	300	9615611
Volatiles					
Methyl-tert-butylether (MTBE)	ug/L	<4.0	<4.0	4.0	9616518
Benzene	ug/L	<0.40	<0.40	0.40	9616518
Toluene	ug/L	<0.40	<0.40	0.40	9616518
Ethylbenzene	ug/L	<0.40	<0.40	0.40	9616518
m & p-Xylene	ug/L	<0.40	<0.40	0.40	9616518
o-Xylene	ug/L	<0.40	<0.40	0.40	9616518
Styrene	ug/L	<0.40	<0.40	0.40	9616518
Xylenes (Total)	ug/L	<0.40	<0.40	0.40	9616518
VH C6-C10	ug/L	<300	<300	300	9616518
Surrogate Recovery (%)					
1,4-Difluorobenzene (sur.)	%	102	101	N/A	9616518
4-Bromofluorobenzene (sur.)	%	102	103	N/A	9616518
D4-1,2-Dichloroethane (sur.)	%	110	119	N/A	9616518

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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GHD Limited
Client Project #: 088877-11-07
Site Location: UPLAND
Your P.O. #: 73506780-04
Sampler Initials: RP

CSR DISSOLVED METALS (NO CV-HG) IN WATER

BV Labs ID		WQ0910		
Sampling Date		2019/10/02 13:20		
COC Number		G132876		
	UNITS	WL-088877-021019-RP-15	RDL	QC Batch
Calculated Parameters				
Dissolved Hardness (CaCO3)	mg/L	371	0.50	9615204
Dissolved Metals by ICPMS				
Dissolved Aluminum (Al)	ug/L	14.6	3.0	9615913
Dissolved Antimony (Sb)	ug/L	<0.50	0.50	9615913
Dissolved Arsenic (As)	ug/L	0.46	0.10	9615913
Dissolved Barium (Ba)	ug/L	15.2	1.0	9615913
Dissolved Beryllium (Be)	ug/L	<0.10	0.10	9615913
Dissolved Bismuth (Bi)	ug/L	<1.0	1.0	9615913
Dissolved Boron (B)	ug/L	<50	50	9615913
Dissolved Cadmium (Cd)	ug/L	0.150	0.010	9615913
Dissolved Chromium (Cr)	ug/L	<1.0	1.0	9615913
Dissolved Cobalt (Co)	ug/L	0.63	0.20	9615913
Dissolved Copper (Cu)	ug/L	13.6	0.20	9615913
Dissolved Iron (Fe)	ug/L	170	5.0	9615913
Dissolved Lead (Pb)	ug/L	<0.20	0.20	9615913
Dissolved Lithium (Li)	ug/L	<2.0	2.0	9615913
Dissolved Manganese (Mn)	ug/L	1760	1.0	9615913
Dissolved Mercury (Hg)	ug/L	<0.050	0.050	9615913
Dissolved Molybdenum (Mo)	ug/L	1.1	1.0	9615913
Dissolved Nickel (Ni)	ug/L	<1.0	1.0	9615913
Dissolved Selenium (Se)	ug/L	0.33	0.10	9615913
Dissolved Silicon (Si)	ug/L	7800	100	9615913
Dissolved Silver (Ag)	ug/L	<0.020	0.020	9615913
Dissolved Strontium (Sr)	ug/L	314	1.0	9615913
Dissolved Thallium (Tl)	ug/L	0.016	0.010	9615913
Dissolved Tin (Sn)	ug/L	<5.0	5.0	9615913
Dissolved Titanium (Ti)	ug/L	<5.0	5.0	9615913
Dissolved Uranium (U)	ug/L	1.22	0.10	9615913
Dissolved Vanadium (V)	ug/L	<5.0	5.0	9615913
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	9615913
Dissolved Zirconium (Zr)	ug/L	0.18	0.10	9615913
RDL = Reportable Detection Limit				

BV Labs Job #: B984674
Report Date: 2020/03/11

GHD Limited
Client Project #: 088877-11-07
Site Location: UPLAND
Your P.O. #: 73506780-04
Sampler Initials: RP

CSR DISSOLVED METALS (NO CV-HG) IN WATER

BV Labs ID		WQ0910		
Sampling Date		2019/10/02 13:20		
COC Number		G132876		
	UNITS	WL-088877-021019-RP-15	RDL	QC Batch
Dissolved Calcium (Ca)	mg/L	116	0.050	9615206
Dissolved Magnesium (Mg)	mg/L	19.5	0.050	9615206
Dissolved Potassium (K)	mg/L	2.22	0.050	9615206
Dissolved Sodium (Na)	mg/L	19.5	0.050	9615206
Dissolved Sulphur (S)	mg/L	22.1	3.0	9615206
Dissolved Sulphur (S)	ug/L	22100	3000	9615913
RDL = Reportable Detection Limit				

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BV Labs Job #: B984674
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GHD Limited
Client Project #: 088877-11-07
Site Location: UPLAND
Your P.O. #: 73506780-04
Sampler Initials: RP

CSR/CCME DISS. METALS IN WATER W/ CV HG (WATER)

BV Labs ID		WQ0908		WQ0909		
Sampling Date		2019/10/02 12:20		2019/10/02 13:15		
COC Number		G132876		G132876		
	UNITS	WL-088877-021019-RP-13	RDL	WL-088877-021019-RP-14	RDL	QC Batch
Calculated Parameters						
Dissolved Hardness (CaCO3)	mg/L	158	0.50	377	0.50	9615204
Elements						
Dissolved Mercury (Hg)	ug/L	<0.0020	0.0020	<0.0020	0.0020	9622659
Dissolved Metals by ICPMS						
Dissolved Aluminum (Al)	ug/L	47.5	6.0	10.2	3.0	9615913
Dissolved Antimony (Sb)	ug/L	<1.0	1.0	<0.50	0.50	9615913
Dissolved Arsenic (As)	ug/L	0.77	0.20	0.45	0.10	9615913
Dissolved Barium (Ba)	ug/L	25.6	2.0	15.1	1.0	9615913
Dissolved Beryllium (Be)	ug/L	<0.20	0.20	<0.10	0.10	9615913
Dissolved Bismuth (Bi)	ug/L	<2.0	2.0	<1.0	1.0	9615913
Dissolved Boron (B)	ug/L	<100	100	<50	50	9615913
Dissolved Cadmium (Cd)	ug/L	<0.020	0.020	0.147	0.010	9615913
Dissolved Chromium (Cr)	ug/L	<2.0	2.0	<1.0	1.0	9615913
Dissolved Cobalt (Co)	ug/L	10.7	0.40	0.63	0.20	9615913
Dissolved Copper (Cu)	ug/L	1.84	0.40	14.9	0.20	9615913
Dissolved Iron (Fe)	ug/L	44600	10	175	5.0	9615913
Dissolved Lead (Pb)	ug/L	<0.40	0.40	<0.20	0.20	9615913
Dissolved Lithium (Li)	ug/L	<4.0	4.0	<2.0	2.0	9615913
Dissolved Manganese (Mn)	ug/L	12100	2.0	1760	1.0	9615913
Dissolved Molybdenum (Mo)	ug/L	<2.0	2.0	1.1	1.0	9615913
Dissolved Nickel (Ni)	ug/L	<2.0	2.0	<1.0	1.0	9615913
Dissolved Selenium (Se)	ug/L	0.21	0.20	0.34	0.10	9615913
Dissolved Silicon (Si)	ug/L	5130	200	7870	100	9615913
Dissolved Silver (Ag)	ug/L	<0.040	0.040	<0.020	0.020	9615913
Dissolved Strontium (Sr)	ug/L	133	2.0	320	1.0	9615913
Dissolved Thallium (Tl)	ug/L	<0.020	0.020	0.017	0.010	9615913
Dissolved Tin (Sn)	ug/L	<10	10	<5.0	5.0	9615913
Dissolved Titanium (Ti)	ug/L	<10	10	<5.0	5.0	9615913
Dissolved Uranium (U)	ug/L	<0.20	0.20	1.22	0.10	9615913
Dissolved Vanadium (V)	ug/L	<10	10	<5.0	5.0	9615913
Dissolved Zinc (Zn)	ug/L	<10	10	5.5	5.0	9615913
RDL = Reportable Detection Limit						

BV Labs Job #: B984674
Report Date: 2020/03/11

GHD Limited
Client Project #: 088877-11-07
Site Location: UPLAND
Your P.O. #: 73506780-04
Sampler Initials: RP

CSR/CCME DISS. METALS IN WATER W/ CV HG (WATER)

BV Labs ID		WQ0908		WQ0909		
Sampling Date		2019/10/02 12:20		2019/10/02 13:15		
COC Number		G132876		G132876		
	UNITS	WL-088877-021019-RP-13	RDL	WL-088877-021019-RP-14	RDL	QC Batch
Dissolved Zirconium (Zr)	ug/L	0.33	0.20	0.17	0.10	9615913
Dissolved Calcium (Ca)	mg/L	42.4	0.10	119	0.050	9615206
Dissolved Magnesium (Mg)	mg/L	12.5	0.10	19.4	0.050	9615206
Dissolved Potassium (K)	mg/L	2.63	0.10	2.26	0.050	9615206
Dissolved Sodium (Na)	mg/L	18.6	0.10	19.3	0.050	9615206
Dissolved Sulphur (S)	mg/L	9.7	6.0	22.1	3.0	9615206
RDL = Reportable Detection Limit						

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BV Labs Job #: B984674
Report Date: 2020/03/11

GHD Limited
Client Project #: 088877-11-07
Site Location: UPLAND
Your P.O. #: 73506780-04
Sampler Initials: RP

CSR/CCME TOT. METALS IN WATER W/ CV HG (WATER)

BV Labs ID		WQ0908		WQ0909		
Sampling Date		2019/10/02 12:20		2019/10/02 13:15		
COC Number		G132876		G132876		
	UNITS	WL-088877-021019-RP-13	RDL	WL-088877-021019-RP-14	RDL	QC Batch
Calculated Parameters						
Total Hardness (CaCO3)	mg/L	166	0.50	378	0.50	9615203
Elements						
Total Mercury (Hg)	ug/L	0.0052	0.0020	0.0026	0.0020	9623282
Total Metals by ICPMS						
Total Aluminum (Al)	ug/L	1010	6.0	54.0	3.0	9619328
Total Antimony (Sb)	ug/L	<1.0	1.0	<0.50	0.50	9619328
Total Arsenic (As)	ug/L	3.70	0.20	0.57	0.10	9619328
Total Barium (Ba)	ug/L	39.6	2.0	16.1	1.0	9619328
Total Beryllium (Be)	ug/L	0.23	0.20	<0.10	0.10	9619328
Total Bismuth (Bi)	ug/L	<2.0	2.0	<1.0	1.0	9619328
Total Boron (B)	ug/L	<100	100	<50	50	9619328
Total Cadmium (Cd)	ug/L	0.342	0.020	0.163	0.010	9619328
Total Chromium (Cr)	ug/L	2.9	2.0	<1.0	1.0	9619328
Total Cobalt (Co)	ug/L	12.9	0.40	0.71	0.20	9619328
Total Copper (Cu)	ug/L	6.2	1.0	16.4	0.50	9619328
Total Iron (Fe)	ug/L	87900	20	1110	10	9619328
Total Lead (Pb)	ug/L	2.09	0.40	<0.20	0.20	9619328
Total Lithium (Li)	ug/L	<4.0	4.0	<2.0	2.0	9619328
Total Manganese (Mn)	ug/L	12300	2.0	1820	1.0	9619328
Total Molybdenum (Mo)	ug/L	<2.0	2.0	1.1	1.0	9619328
Total Nickel (Ni)	ug/L	2.0	2.0	<1.0	1.0	9619328
Total Selenium (Se)	ug/L	0.66	0.20	0.36	0.10	9619328
Total Silicon (Si)	ug/L	6160	200	7490	100	9619328
Total Silver (Ag)	ug/L	<0.040	0.040	<0.020	0.020	9619328
Total Strontium (Sr)	ug/L	146	2.0	324	1.0	9619328
Total Thallium (Tl)	ug/L	0.030	0.020	0.016	0.010	9619328
Total Tin (Sn)	ug/L	<10	10	<5.0	5.0	9619328
Total Titanium (Ti)	ug/L	72	10	<5.0	5.0	9619328
Total Uranium (U)	ug/L	0.30	0.20	1.19	0.10	9619328
Total Vanadium (V)	ug/L	20	10	<5.0	5.0	9619328
Total Zinc (Zn)	ug/L	16	10	<5.0	5.0	9619328

RDL = Reportable Detection Limit

Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

BV Labs Job #: B984674
Report Date: 2020/03/11

GHD Limited
Client Project #: 088877-11-07
Site Location: UPLAND
Your P.O. #: 73506780-04
Sampler Initials: RP

CSR/CCME TOT. METALS IN WATER W/ CV HG (WATER)

BV Labs ID		WQ0908		WQ0909		
Sampling Date		2019/10/02 12:20		2019/10/02 13:15		
COC Number		G132876		G132876		
	UNITS	WL-088877-021019-RP-13	RDL	WL-088877-021019-RP-14	RDL	QC Batch
Total Zirconium (Zr)	ug/L	1.01	0.20	0.15	0.10	9619328
Total Calcium (Ca)	mg/L	45.2	0.10	119	0.050	9615208
Total Magnesium (Mg)	mg/L	13.0	0.10	19.8	0.050	9615208
Total Potassium (K)	mg/L	2.71	0.10	2.26	0.050	9615208
Total Sodium (Na)	mg/L	19.4	0.10	19.7	0.050	9615208
Total Sulphur (S)	mg/L	10.8	6.0	21.8	3.0	9615208
RDL = Reportable Detection Limit						

Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

GHD Limited
Client Project #: 088877-11-07
Site Location: UPLAND
Your P.O. #: 73506780-04
Sampler Initials: RP

CSR/CCME TOT. METALS IN WATER W/ CV HG (WATER)

BV Labs ID		WQ0910		
Sampling Date		2019/10/02 13:20		
COC Number		G132876		
	UNITS	WL-088877-021019-RP-15	RDL	QC Batch
Calculated Parameters				
Total Hardness (CaCO3)	mg/L	384	0.50	9615203
Elements				
Total Mercury (Hg)	ug/L	<0.0020	0.0020	9617712
Total Metals by ICPMS				
Total Aluminum (Al)	ug/L	59.3	3.0	9619328
Total Antimony (Sb)	ug/L	<0.50	0.50	9619328
Total Arsenic (As)	ug/L	0.59	0.10	9619328
Total Barium (Ba)	ug/L	16.3	1.0	9619328
Total Beryllium (Be)	ug/L	<0.10	0.10	9619328
Total Bismuth (Bi)	ug/L	<1.0	1.0	9619328
Total Boron (B)	ug/L	<50	50	9619328
Total Cadmium (Cd)	ug/L	0.170	0.010	9619328
Total Chromium (Cr)	ug/L	<1.0	1.0	9619328
Total Cobalt (Co)	ug/L	0.70	0.20	9619328
Total Copper (Cu)	ug/L	16.5	0.50	9619328
Total Iron (Fe)	ug/L	1110	10	9619328
Total Lead (Pb)	ug/L	<0.20	0.20	9619328
Total Lithium (Li)	ug/L	<2.0	2.0	9619328
Total Manganese (Mn)	ug/L	1840	1.0	9619328
Total Molybdenum (Mo)	ug/L	1.1	1.0	9619328
Total Nickel (Ni)	ug/L	<1.0	1.0	9619328
Total Selenium (Se)	ug/L	0.34	0.10	9619328
Total Silicon (Si)	ug/L	7580	100	9619328
Total Silver (Ag)	ug/L	<0.020	0.020	9619328
Total Strontium (Sr)	ug/L	327	1.0	9619328
Total Thallium (Tl)	ug/L	0.014	0.010	9619328
Total Tin (Sn)	ug/L	<5.0	5.0	9619328
Total Titanium (Ti)	ug/L	<5.0	5.0	9619328
Total Uranium (U)	ug/L	1.20	0.10	9619328
Total Vanadium (V)	ug/L	<5.0	5.0	9619328
Total Zinc (Zn)	ug/L	<5.0	5.0	9619328

RDL = Reportable Detection Limit

BV Labs Job #: B984674
Report Date: 2020/03/11

GHD Limited
Client Project #: 088877-11-07
Site Location: UPLAND
Your P.O. #: 73506780-04
Sampler Initials: RP

CSR/CCME TOT. METALS IN WATER W/ CV HG (WATER)

BV Labs ID		WQ0910		
Sampling Date		2019/10/02 13:20		
COC Number		G132876		
	UNITS	**WL-088877-021019-RP-15**	**RDL**	**QC Batch**
Total Zirconium (Zr)	ug/L	0.16	0.10	9619328
Total Calcium (Ca)	mg/L	121	0.050	9615208
Total Magnesium (Mg)	mg/L	20.1	0.050	9615208
Total Potassium (K)	mg/L	2.29	0.050	9615208
Total Sodium (Na)	mg/L	20.0	0.050	9615208
Total Sulphur (S)	mg/L	22.1	3.0	9615208
RDL = Reportable Detection Limit				

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BV Labs Job #: B984674
Report Date: 2020/03/11

GHD Limited
Client Project #: 088877-11-07
Site Location: UPLAND
Your P.O. #: 73506780-04
Sampler Initials: RP

CSR PAH IN WATER BY GC-MS (WATER)

BV Labs ID		WQ0908	WQ0909	WQ0910		
Sampling Date		2019/10/02 12:20	2019/10/02 13:15	2019/10/02 13:20		
COC Number		G132876	G132876	G132876		
	UNITS	WL-088877-021019-RP-13	WL-088877-021019-RP-14	WL-088877-021019-RP-15	RDL	QC Batch
Calculated Parameters						
Low Molecular Weight PAH`s	ug/L	<0.10	2.1	2.0	0.10	9615214
High Molecular Weight PAH`s	ug/L	<0.050	0.30	0.32	0.050	9615214
Total PAH	ug/L	<0.10	2.4	2.3	0.10	9615214
Polycyclic Aromatics						
Quinoline	ug/L	<0.020	<0.020	<0.020	0.020	9615987
Naphthalene	ug/L	<0.10	0.93	0.90	0.10	9615987
1-Methylnaphthalene	ug/L	<0.050	0.18	0.18	0.050	9615987
2-Methylnaphthalene	ug/L	<0.10	0.13	0.13	0.10	9615987
Acenaphthylene	ug/L	<0.050	<0.050	<0.050	0.050	9615987
Acenaphthene	ug/L	<0.050	0.38	0.38	0.050	9615987
Fluorene	ug/L	<0.050	0.15	0.16	0.050	9615987
Phenanthrene	ug/L	<0.050	0.15	0.15	0.050	9615987
Anthracene	ug/L	0.010	0.083	0.077	0.010	9615987
Acridine	ug/L	<0.050	0.071	0.058	0.050	9615987
Fluoranthene	ug/L	<0.020	0.13	0.14	0.020	9615987
Pyrene	ug/L	<0.020	0.12	0.13	0.020	9615987
Benzo(a)anthracene	ug/L	<0.010	0.011	0.012	0.010	9615987
Chrysene	ug/L	<0.020	0.027	0.028	0.020	9615987
Benzo(b&j)fluoranthene	ug/L	<0.030	<0.030	<0.030	0.030	9615987
Benzo(k)fluoranthene	ug/L	<0.050	<0.050	<0.050	0.050	9615987
Benzo(a)pyrene	ug/L	<0.0050	0.0064	0.0088	0.0050	9615987
Indeno(1,2,3-cd)pyrene	ug/L	<0.050	<0.050	<0.050	0.050	9615987
Dibenz(a,h)anthracene	ug/L	<0.0030	<0.0030	<0.0030	0.0030	9615987
Benzo(g,h,i)perylene	ug/L	<0.050	<0.050	<0.050	0.050	9615987
Surrogate Recovery (%)						
D10-ANTHRACENE (sur.)	%	94	87	92	N/A	9615987
D8-ACENAPHTHYLENE (sur.)	%	93	88	93	N/A	9615987
D8-NAPHTHALENE (sur.)	%	94	87	85	N/A	9615987
TERPHENYL-D14 (sur.)	%	91	87	101	N/A	9615987

RDL = Reportable Detection Limit
N/A = Not Applicable

BV Labs Job #: B984674
Report Date: 2020/03/11

GHD Limited
Client Project #: 088877-11-07
Site Location: UPLAND
Your P.O. #: 73506780-04
Sampler Initials: RP

GENERAL COMMENTS

Version 2: Report reissued to include the data for Alkalinity and Sulphate for below samples as per client request on the CoC
WL-088877-021019-RP-13
WL-088877-021019-RP-14
WL-088877-021019-RP-15

CSR/CCME DISS. METALS IN WATER W/ CV HG (WATER) Comments

Sample WQ0908 [WL-088877-021019-RP-13] Elements by CRC ICPMS (dissolved): RDL raised due to concentration over linear range, sample dilution required.

CSR/CCME TOT. METALS IN WATER W/ CV HG (WATER) Comments

Sample WQ0908 [WL-088877-021019-RP-13] Elements by CRC ICPMS (total): RDL raised due to concentration over linear range, sample dilution required.

Results relate only to the items tested.

BV Labs Job #: B984674
Report Date: 2020/03/11

QUALITY ASSURANCE REPORT

GHD Limited
Client Project #: 088877-11-07
Site Location: UPLAND
Your P.O. #: 73506780-04
Sampler Initials: RP

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9615987	D10-ANTHRACENE (sur.)	2019/10/06	98	50 - 140	96	50 - 140	99	%		
9615987	D8-ACENAPHTHYLENE (sur.)	2019/10/06	100	50 - 140	94	50 - 140	96	%		
9615987	D8-NAPHTHALENE (sur.)	2019/10/06	89	50 - 140	91	50 - 140	92	%		
9615987	TERPHENYL-D14 (sur.)	2019/10/06	97	50 - 140	100	50 - 140	102	%		
9616518	1,4-Difluorobenzene (sur.)	2019/10/05	94 (3)	70 - 130	96	70 - 130	100	%		
9616518	4-Bromofluorobenzene (sur.)	2019/10/05	101 (3)	70 - 130	101	70 - 130	102	%		
9616518	D4-1,2-Dichloroethane (sur.)	2019/10/05	99 (3)	70 - 130	94	70 - 130	117	%		
9617505	1,4-Difluorobenzene (sur.)	2019/10/07	97	70 - 130	99	70 - 130	100	%		
9617505	4-Bromofluorobenzene (sur.)	2019/10/07	95	70 - 130	95	70 - 130	98	%		
9617505	D4-1,2-Dichloroethane (sur.)	2019/10/07	99	70 - 130	101	70 - 130	106	%		
9615615	Biochemical Oxygen Demand	2019/10/09			95	85 - 115	<2.0	mg/L	2.5 (1)	20
9615913	Dissolved Aluminum (Al)	2019/10/05	98	80 - 120	101	80 - 120	<3.0	ug/L	NC (1)	20
9615913	Dissolved Antimony (Sb)	2019/10/05	98	80 - 120	99	80 - 120	<0.50	ug/L	NC (1)	20
9615913	Dissolved Arsenic (As)	2019/10/05	101	80 - 120	101	80 - 120	<0.10	ug/L	NC (1)	20
9615913	Dissolved Barium (Ba)	2019/10/05	100	80 - 120	104	80 - 120	<1.0	ug/L	0.69 (1)	20
9615913	Dissolved Beryllium (Be)	2019/10/05	97	80 - 120	99	80 - 120	<0.10	ug/L	NC (1)	20
9615913	Dissolved Bismuth (Bi)	2019/10/05	97	80 - 120	101	80 - 120	<1.0	ug/L	NC (1)	20
9615913	Dissolved Boron (B)	2019/10/05	93	80 - 120	96	80 - 120	<50	ug/L	NC (1)	20
9615913	Dissolved Cadmium (Cd)	2019/10/05	99	80 - 120	101	80 - 120	<0.010	ug/L	NC (1)	20
9615913	Dissolved Chromium (Cr)	2019/10/05	99	80 - 120	103	80 - 120	<1.0	ug/L	0.69 (1)	20
9615913	Dissolved Cobalt (Co)	2019/10/05	97	80 - 120	102	80 - 120	<0.20	ug/L	NC (1)	20
9615913	Dissolved Copper (Cu)	2019/10/05	96	80 - 120	102	80 - 120	<0.20	ug/L	3.4 (1)	20
9615913	Dissolved Iron (Fe)	2019/10/05	97	80 - 120	103	80 - 120	<5.0	ug/L	NC (1)	20
9615913	Dissolved Lead (Pb)	2019/10/05	101	80 - 120	105	80 - 120	<0.20	ug/L	NC (1)	20
9615913	Dissolved Lithium (Li)	2019/10/05	98	80 - 120	102	80 - 120	<2.0	ug/L	NC (1)	20
9615913	Dissolved Manganese (Mn)	2019/10/05	100	80 - 120	105	80 - 120	<1.0	ug/L	NC (1)	20
9615913	Dissolved Mercury (Hg)	2019/10/05	99	80 - 120	99	80 - 120	<0.050	ug/L		
9615913	Dissolved Molybdenum (Mo)	2019/10/05	103	80 - 120	102	80 - 120	<1.0	ug/L	NC (1)	20
9615913	Dissolved Nickel (Ni)	2019/10/05	97	80 - 120	103	80 - 120	<1.0	ug/L	NC (1)	20
9615913	Dissolved Selenium (Se)	2019/10/05	102	80 - 120	101	80 - 120	<0.10	ug/L	0.43 (1)	20
9615913	Dissolved Silicon (Si)	2019/10/05	NC	80 - 120	102	80 - 120	<100	ug/L	1.1 (1)	20

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9615913	Dissolved Silver (Ag)	2019/10/05	97	80 - 120	101	80 - 120	<0.020	ug/L	NC (1)	20
9615913	Dissolved Strontium (Sr)	2019/10/05	NC	80 - 120	100	80 - 120	<1.0	ug/L	1.9 (1)	20
9615913	Dissolved Sulphur (S)	2019/10/05	100	80 - 120	100	80 - 120	<3000	ug/L		
9615913	Dissolved Thallium (Tl)	2019/10/05	99	80 - 120	102	80 - 120	<0.010	ug/L	NC (1)	20
9615913	Dissolved Tin (Sn)	2019/10/05	92	80 - 120	93	80 - 120	<5.0	ug/L	NC (1)	20
9615913	Dissolved Titanium (Ti)	2019/10/05	101	80 - 120	104	80 - 120	<5.0	ug/L	NC (1)	20
9615913	Dissolved Uranium (U)	2019/10/05	105	80 - 120	107	80 - 120	<0.10	ug/L	NC (1)	20
9615913	Dissolved Vanadium (V)	2019/10/05	99	80 - 120	101	80 - 120	<5.0	ug/L	NC (1)	20
9615913	Dissolved Zinc (Zn)	2019/10/05	102	80 - 120	106	80 - 120	<5.0	ug/L	NC (1)	20
9615913	Dissolved Zirconium (Zr)	2019/10/05	100	80 - 120	98	80 - 120	<0.10	ug/L	NC (1)	20
9615987	1-Methylnaphthalene	2019/10/06	105	50 - 140	92	50 - 140	<0.050	ug/L	0.89 (1)	40
9615987	2-Methylnaphthalene	2019/10/06	NC	50 - 140	90	50 - 140	<0.10	ug/L	3.7 (1)	40
9615987	Acenaphthene	2019/10/06	104	50 - 140	95	50 - 140	<0.050	ug/L	4.8 (1)	40
9615987	Acenaphthylene	2019/10/06	110	50 - 140	99	50 - 140	<0.050	ug/L	NC (1)	40
9615987	Acridine	2019/10/06	105	50 - 140	101	50 - 140	<0.050	ug/L	NC (1)	40
9615987	Anthracene	2019/10/06	102	50 - 140	95	50 - 140	<0.010	ug/L	0.69 (1)	40
9615987	Benzo(a)anthracene	2019/10/06	104	50 - 140	98	50 - 140	<0.010	ug/L	NC (1)	40
9615987	Benzo(a)pyrene	2019/10/06	55	50 - 140	100	50 - 140	<0.0050	ug/L	NC (1)	40
9615987	Benzo(b&j)fluoranthene	2019/10/06	55	50 - 140	97	50 - 140	<0.030	ug/L	NC (1)	40
9615987	Benzo(g,h,i)perylene	2019/10/06	33 (2)	50 - 140	100	50 - 140	<0.050	ug/L	NC (1)	40
9615987	Benzo(k)fluoranthene	2019/10/06	48 (2)	50 - 140	84	50 - 140	<0.050	ug/L	NC (1)	40
9615987	Chrysene	2019/10/06	106	50 - 140	100	50 - 140	<0.020	ug/L	NC (1)	40
9615987	Dibenz(a,h)anthracene	2019/10/06	33 (2)	50 - 140	96	50 - 140	<0.0030	ug/L	NC (1)	40
9615987	Fluoranthene	2019/10/06	107	50 - 140	104	50 - 140	<0.020	ug/L	9.2 (1)	40
9615987	Fluorene	2019/10/06	103	50 - 140	94	50 - 140	<0.050	ug/L	3.7 (1)	40
9615987	Indeno(1,2,3-cd)pyrene	2019/10/06	34 (2)	50 - 140	100	50 - 140	<0.050	ug/L	NC (1)	40
9615987	Naphthalene	2019/10/06	NC	50 - 140	91	50 - 140	<0.10	ug/L	0.90 (1)	40
9615987	Phenanthrene	2019/10/06	103	50 - 140	95	50 - 140	<0.050	ug/L	2.2 (1)	40
9615987	Pyrene	2019/10/06	108	50 - 140	104	50 - 140	<0.020	ug/L	5.1 (1)	40
9615987	Quinoline	2019/10/06	135	50 - 140	114	50 - 140	<0.020	ug/L	NC (1)	40
9616150	Nitrate plus Nitrite (N)	2019/10/04			108	80 - 120	<0.10	mg/L		

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9616151	Nitrite (N)	2019/10/04			103	80 - 120	<0.10	mg/L		
9616518	Benzene	2019/10/05	105 (3)	70 - 130	97	70 - 130	<0.40	ug/L	NC (4)	30
9616518	Ethylbenzene	2019/10/05	104 (3)	70 - 130	101	70 - 130	<0.40	ug/L	NC (4)	30
9616518	m & p-Xylene	2019/10/05	100 (3)	70 - 130	98	70 - 130	<0.40	ug/L	NC (4)	30
9616518	Methyl-tert-butylether (MTBE)	2019/10/05	110 (3)	70 - 130	103	70 - 130	<4.0	ug/L	NC (4)	30
9616518	o-Xylene	2019/10/05	105 (3)	70 - 130	102	70 - 130	<0.40	ug/L	NC (4)	30
9616518	Styrene	2019/10/05	107 (3)	70 - 130	104	70 - 130	<0.40	ug/L	NC (4)	30
9616518	Toluene	2019/10/05	99 (3)	70 - 130	93	70 - 130	<0.40	ug/L	NC (4)	30
9616518	VH C6-C10	2019/10/05			87	70 - 130	<300	ug/L	NC (4)	30
9616518	Xylenes (Total)	2019/10/05					<0.40	ug/L	NC (4)	30
9616637	Orthophosphate (P)	2019/10/05	99	80 - 120	93	80 - 120	<0.0030	mg/L	NC (1)	20
9616797	Total Suspended Solids	2019/10/06	91	80 - 120	92	80 - 120	<1.0	mg/L	0 (1)	20
9617505	Benzene	2019/10/07	105	70 - 130	99	70 - 130	<0.40	ug/L	NC (1)	30
9617505	Ethylbenzene	2019/10/07	109	70 - 130	105	70 - 130	<0.40	ug/L	NC (1)	30
9617505	m & p-Xylene	2019/10/07	113	70 - 130	110	70 - 130	<0.40	ug/L	NC (1)	30
9617505	Methyl-tert-butylether (MTBE)	2019/10/07	107	70 - 130	103	70 - 130	<4.0	ug/L	NC (1)	30
9617505	o-Xylene	2019/10/07	109	70 - 130	105	70 - 130	<0.40	ug/L	NC (1)	30
9617505	Styrene	2019/10/07	97	70 - 130	98	70 - 130	<0.40	ug/L	NC (1)	30
9617505	Toluene	2019/10/07	101	70 - 130	98	70 - 130	<0.40	ug/L	NC (1)	30
9617505	VH C6-C10	2019/10/07			99	70 - 130	<300	ug/L	NC (1)	30
9617505	Xylenes (Total)	2019/10/07					<0.40	ug/L	NC (1)	30
9617712	Total Mercury (Hg)	2019/10/07	94	80 - 120	108	80 - 120	<0.0020	ug/L	NC (1)	20
9617874	Dissolved Chloride (Cl)	2019/10/04			103	80 - 120	<1.0	mg/L		
9617874	Dissolved Sulphate (SO4)	2019/10/04			93	80 - 120	<1.0	mg/L		
9618004	Chemical Oxygen Demand	2019/10/08	NC	80 - 120	96	80 - 120	<10	mg/L	1.6 (1)	20
9618131	Total Sulphide	2019/10/07	29 (2)	80 - 120	97	80 - 120	<0.0018	mg/L	NC (1)	20
9619167	Total Dissolved Solids	2019/10/09	104	80 - 120	96	80 - 120	<10	mg/L	0.77 (5)	20
9619205	Total Ammonia (N)	2019/10/08	91	80 - 120	94	80 - 120	<0.015	mg/L	6.8 (1)	20
9619328	Total Aluminum (Al)	2019/10/09	96	80 - 120	98	80 - 120	<3.0	ug/L	1.9 (1)	20
9619328	Total Antimony (Sb)	2019/10/09	102	80 - 120	103	80 - 120	<0.50	ug/L	NC (1)	20
9619328	Total Arsenic (As)	2019/10/09	106	80 - 120	103	80 - 120	<0.10	ug/L	8.9 (1)	20

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9619328	Total Barium (Ba)	2019/10/09	102	80 - 120	103	80 - 120	<1.0	ug/L	0.015 (1)	20
9619328	Total Beryllium (Be)	2019/10/09	85	80 - 120	92	80 - 120	<0.10	ug/L	NC (1)	20
9619328	Total Bismuth (Bi)	2019/10/09	95	80 - 120	103	80 - 120	<1.0	ug/L	NC (1)	20
9619328	Total Boron (B)	2019/10/09	85	80 - 120	90	80 - 120	<50	ug/L	2.2 (1)	20
9619328	Total Cadmium (Cd)	2019/10/09	100	80 - 120	104	80 - 120	<0.010	ug/L	5.3 (1)	20
9619328	Total Chromium (Cr)	2019/10/09	100	80 - 120	102	80 - 120	<1.0	ug/L	NC (1)	20
9619328	Total Cobalt (Co)	2019/10/09	97	80 - 120	103	80 - 120	<0.20	ug/L	0.14 (1)	20
9619328	Total Copper (Cu)	2019/10/09	91	80 - 120	102	80 - 120	<0.50	ug/L	1.9 (1)	20
9619328	Total Iron (Fe)	2019/10/09	98	80 - 120	105	80 - 120	<10	ug/L	0.42 (1)	20
9619328	Total Lead (Pb)	2019/10/09	100	80 - 120	106	80 - 120	<0.20	ug/L	NC (1)	20
9619328	Total Lithium (Li)	2019/10/09	75 (2)	80 - 120	85	80 - 120	<2.0	ug/L	2.8 (1)	20
9619328	Total Manganese (Mn)	2019/10/09	100	80 - 120	103	80 - 120	<1.0	ug/L	1.1 (1)	20
9619328	Total Molybdenum (Mo)	2019/10/09	112	80 - 120	101	80 - 120	<1.0	ug/L	1.2 (1)	20
9619328	Total Nickel (Ni)	2019/10/09	93	80 - 120	102	80 - 120	<1.0	ug/L	0.88 (1)	20
9619328	Total Selenium (Se)	2019/10/09	104	80 - 120	101	80 - 120	<0.10	ug/L	0.67 (1)	20
9619328	Total Silicon (Si)	2019/10/09	99	80 - 120	101	80 - 120	<100	ug/L	1.6 (1)	20
9619328	Total Silver (Ag)	2019/10/09	98	80 - 120	101	80 - 120	<0.020	ug/L	NC (1)	20
9619328	Total Strontium (Sr)	2019/10/09	NC	80 - 120	101	80 - 120	<1.0	ug/L	0.65 (1)	20
9619328	Total Thallium (Tl)	2019/10/09	98	80 - 120	105	80 - 120	<0.010	ug/L	4.7 (1)	20
9619328	Total Tin (Sn)	2019/10/09	96	80 - 120	97	80 - 120	<5.0	ug/L	NC (1)	20
9619328	Total Titanium (Ti)	2019/10/09	102	80 - 120	102	80 - 120	<5.0	ug/L	NC (1)	20
9619328	Total Uranium (U)	2019/10/09	104	80 - 120	104	80 - 120	<0.10	ug/L	0.83 (1)	20
9619328	Total Vanadium (V)	2019/10/09	102	80 - 120	100	80 - 120	<5.0	ug/L	NC (1)	20
9619328	Total Zinc (Zn)	2019/10/09	91	80 - 120	103	80 - 120	<5.0	ug/L	1.9 (1)	20
9619328	Total Zirconium (Zr)	2019/10/09	111	80 - 120	104	80 - 120	<0.10	ug/L	NC (1)	20
9619971	Alkalinity (PP as CaCO3)	2019/10/08					<1.0	mg/L	NC (1)	20
9619971	Alkalinity (Total as CaCO3)	2019/10/08	NC	80 - 120	99	80 - 120	<1.0	mg/L	2.1 (1)	20
9619971	Bicarbonate (HCO3)	2019/10/08					<1.0	mg/L	2.1 (1)	20
9619971	Carbonate (CO3)	2019/10/08					<1.0	mg/L	NC (1)	20
9619971	Hydroxide (OH)	2019/10/08					<1.0	mg/L	NC (1)	20
9619974	pH	2019/10/08			102	97 - 103			0.37 (1)	N/A

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9619975	Conductivity	2019/10/08			99	80 - 120	<2.0	uS/cm	0.35 (1)	10
9622659	Dissolved Mercury (Hg)	2019/10/11	75 (2)	80 - 120	91	80 - 120	<0.0020	ug/L	NC (1)	20
9623282	Total Mercury (Hg)	2019/10/11	46 (2)	80 - 120	100	80 - 120	<0.0020	ug/L	NC (1)	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Duplicate Parent ID

(2) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

(3) Matrix Spike Parent ID [WQ0936-01]

(4) Duplicate Parent ID [WQ0936-01]

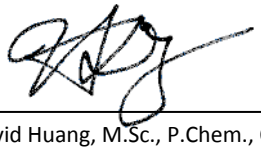
(5) Duplicate Parent ID [WQ0910-03]

BV Labs Job #: B984674
Report Date: 2020/03/11

GHD Limited
Client Project #: 088877-11-07
Site Location: UPLAND
Your P.O. #: 73506780-04
Sampler Initials: RP

VALIDATION SIGNATURE PAGE

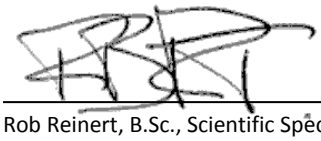
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



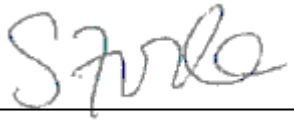
David Huang, M.Sc., P.Chem., QP, Scientific Services Manager

Ghayasuddin Khan, M.Sc., P.Chem., QP, Scientific Specialist, Inorganics

Jose Cueva, Supervisor, Organics-VOC & HC



Rob Reinert, B.Sc., Scientific Specialist



Suwan Fock, B.Sc., QP, Inorganics Senior Analyst

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports.
For Service Group specific validation please refer to the Validation Signature Page.

Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam
A Bureau Veritas Group Company

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5 Toll Free (800) 665 8566
Victoria: 460 Tennyson Place, Unit 1, Victoria, BC V8Z 6S8 Toll Free (866) 385-6112
maxxam.ca

CHAIN OF CUSTODY RECORD

G132876

Page 1 of 1

Invoice Information	Report Information (if differs from invoice)	Project Information	Turnaround Time (TAT) Required
Company: #163 GHD Limited	Company: #28639 GHD Limited	Quotation: B80076	[X] 5 - 7 Days Regular (Most analyses)
Contact Name: Accounts Payable	Contact Name:	P.O. #/AFE#: 73506780-04	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 651 Colby Drive	Address:		Rush TAT (Surcharges will be applied)
Waterloo, ON PC:	PC:	Project #: 088877-11-07	[ ] Same Day [ ] 2 Days
Phone/Fax:	Phone/Fax:	Site Location: Upland	[ ] 1 Day [ ] 3-4 Days
Email: aresse.macphea@ghd.com	Email: rosemarie.recca@ghd.com	Site #:	Date Required:
Copies:	Copies:	Sampled By: RPlaha	Rush Confirmation #:

Laboratory Use Only

	YES	NO	Cooler ID 1
Seal Present		X	
Seal Intact	—		Temp 7 0 1
Cooling Media	X		

Depot Reception

Regulatory Criteria: [ ] BC CSR [ ] YK CSR [ ] CCME [ ] Drinking Water [ ] BC Water Quality [ ] Other

Analysis Requested

#	Sample Identification	Date Sampled (yyyy/mm/dd)	Time Sampled (hh:mm)	Matrix	# of Containers	[X] BTEXS / VPH	[ ] BTEX F1	[X] PAH	[ ] EPH	[X] Dissolved Metals	[X] Dissolved Mercury	[X] Total Metals	[X] Total Mercury	[X] Chloride (diss.)	[X] TSS	[X] pH	[X] Nitrite	Nitrite/Nitrate, orthophosphate	sulphide, hydrogen sulphide	Hardness (dissolved)	HOLD - DO NOT ANALYZE
1	WL-088877-021019-RP-13	2019/10/02	1220	WL	16	X		X		X	X	X	X	X	X	X	X	X	+	X	
2	↓ - ↓ - ↓ - ↓ -14	↓	1315	WL	16	X		X		X	X	X	X	X	X	X	X	X	+	X	
3	↓ - ↓ - ↓ - ↓ -15	↓	1320	WL	16	X		X		X	X	X	X	X	X	X	X	X	+	X	
4	WL-088874-300919-RP-04	2019/09/30	1605	WL	16	X		X		X	X	X	X	X	X	X	X	X	X	X	
5																					
6																					
7																					
8																					
9																					
10																					

Other analysis options on form (unchecked/checked): [ ] MTBE, [ ] VOC / BTEXS / VPH, [ ] VOC / BTEX / F1, [ ] LEPH / HEPH / PAH, [ ] TEH, [ ] F2 - F4, [X] Filtered?, [X] Preserved?, [X] Filtered?, [X] Preserved?, [X] Field Preserved?, [X] Field Preserved?, [ ] Fluoride, [X] Sulphate (diss.), [X] TDS, [X] BOD, [X] COD, [X] Conductivity, [X] Alkalinity (speciated), [X] Nitrate, [X] Ammonia

Special Instructions: Short holding times ↓

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgement and acceptance of

Relinquished by: (Signature/ Print)	Date (yyyy/mm/dd):	Time (hh:mm):	Received by: (Signature/ Print)	Date (yyyy/mm/dd):	Time (hh:mm):
Rimi Plaha	2019/10/03	08:00	PEDRO TAQ	2019/10/03	09:31

B984674_COC

COC-1020 181

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BV FCD-00077/9

Appendix D
Data Validation and Assessment Memorandum

Memorandum

October 30, 2019

To:	Rose Marie Rocca; Chris Thorne; Airesse MacPhee	Ref. No.:	088877-07-02
From:	Stephanie Berton/ev/2		

Subject: **Data Validation and Assessment**

Laboratory:	Bureau Veritas Laboratories (BV)	**Date(s) Sampled:**	September 30 and October 2, 2019
Lab Job No.:	B984003/B984674		
Media Sampled:	Water		

QA/QC	Criteria	Pass	Qualifiers	Fail	N/A
Holding Times	Analyte specific	☐	☒	☐	☐
Temperature	Analyte specific	☒	☐	☐	☐
Field Duplicate (blind)	Matrix specific	☒	☐	☐	☐
Field Replicate (blind)	Matrix specific	☐	☐	☐	☒
Field Blank (blind)	Non-detect	☐	☐	☐	☒
Trip Blank	Non-detect	☒	☐	☐	☐
Equipment Blank (blind)	Non-detect	☐	☐	☐	☒
Lab QA/QC	Within standard recoveries	☒	☐	☐	☐

Data OK for Use Yes ☐ With Qualifiers ☒ No ☐ Initial: SB

The following results are qualified due to holding time exceedances:

Lab Report #	Sample Date (mm/dd/yyyy)	Sample ID	Analyte	Result	Qualifier	Units
B984003	09/30/2019	WG-088877-300919-RP-01	pH		J	s.u.
B984003	09/30/2019	WG-088877-300919-RP-02	pH		J	s.u.
B984003	09/30/2019	WG-088877-300919-RP-03	pH		J	s.u.
B984674	10/02/2019	WL-088877-021019-RP-13	pH		J	s.u.
B984674	10/02/2019	WL-088877-021019-RP-14	pH		J	s.u.
B984674	10/02/2019	WL-088877-021019-RP-15	pH		J	s.u.

Notes:

J - Estimated concentration
s.u. - Standard Unit

GHD
10271 Shellbridge Way Suite 165 Richmond British Columbia V6X 2W8 Canada
T 604 214 0510 **F** 604 214 0525 **W** www.ghd.com

Memorandum

March 11, 2020
Revised March 31, 2020

To:	Rose Marie Rocca, Chris Thorne	Ref. No.:	088877
From:	Airesse MacPhee/an/6	Tel:	604-248-3661

Subject: **Data Quality Assessment and Validation**

Laboratory:	Maxxam Analytics International Corporation	**Date(s) Sampled:**	March 6-7, May 7, 2019
Lab Job No.:	B917080, B917081, B935526		
Media Sampled:	Water		

QA/QC	Criteria	Pass	Qualifiers	Fail	N/A
Holding Times	Analyte specific	☐	☒	☐	☐
Field Duplicate (blind)	Matrix specific	☒	☐	☐	☐
Field Blank (blind)	Non-detect	☒	☐	☐	☐
Trip Blank	Non-detect	☐	☐	☐	☒
Temperature	Analyte specific	☒	☐	☐	☐
Lab QA/QC	Within standard recoveries	☐	☒	☐	☐

Data OK for Use Yes ☐ With Qualifiers ☒ No ☐ Initial: AM

The following results are qualified based on holding time exceedance:

Lab Report #	Sample Date (mm/dd/yyyy)	Sample ID	Analyte	Result	Qualifier	Units
B917080	03/07/2019	WL-88877-070319-RMR-07	pH	7.77	J	s.u.
B917081	03/06/2019	W-88877-060319-RMR-01	pH	7.62	J	s.u.
B917081	03/07/2019	WG-88877-070319-RMR-02	pH	7.85	J	s.u.
B917081	03/07/2019	WG-88877-070319-RMR-03	pH	7.53	J	s.u.
B917081	03/07/2019	WG-88877-070319-RMR-04	pH	7.49	J	s.u.
B917081	03/07/2019	WG-88877-070319-RMR-05	pH	7.92	J	s.u.
B917081	03/07/2019	WG-88877-070319-RMR-06	pH	7.56	J	s.u.

The following results are qualified based on incorrect sample preservation. Due to volatility of analyte, a low bias in the results is likely.

Lab Report #	Sample Date (mm/dd/yyyy)	Sample ID	Analyte	Result	Qualifier	Units
B917080	03/07/2019	WL-88877-070319-RMR-07	Hydrogen sulfide	0.032	J	mg/L
B917080	03/07/2019	WL-88877-070319-RMR-07	Sulfide	0.030	J	mg/L
B917081	03/06/2019	W-88877-060319-RMR-01	Hydrogen sulfide	0.017	J	mg/L

Lab Report #	Sample Date (mm/dd/yyyy)	Sample ID	Analyte	Result	Qualifier	Units
B917081	03/06/2019	W-88877-060319-RMR-01	Sulfide	0.016	J	mg/L
B935526	05/07/2019	WG-88877-070519-DB-01	Hydrogen sulfide	0.026	J	mg/L
B935526	05/07/2019	WG-88877-070519-DB-01	pH	7.91	J	s.u.
B935526	05/07/2019	WG-88877-070519-DB-01	Sulfide	0.025	J	mg/L
B935526	05/07/2019	WG-88877-070519-DB-01	Total suspended solids (TSS)	1100	J	mg/L

Notes:

J - Estimated concentration
s.u. - Standard Units

Appendix E
Concentration versus Time Plots

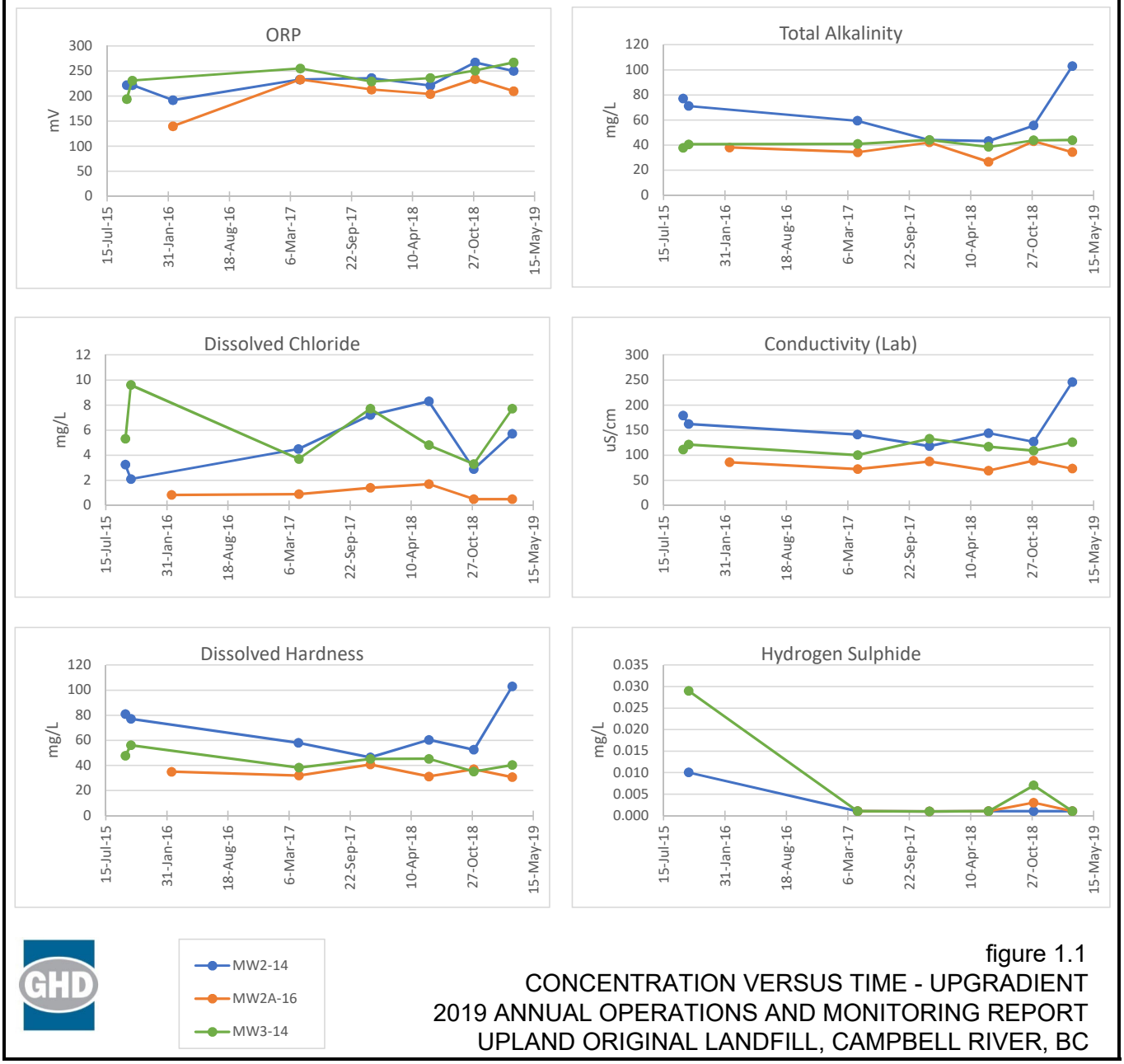


figure 1.1
CONCENTRATION VERSUS TIME - UPGRADIENT
2019 ANNUAL OPERATIONS AND MONITORING REPORT
UPLAND ORIGINAL LANDFILL, CAMPBELL RIVER, BC

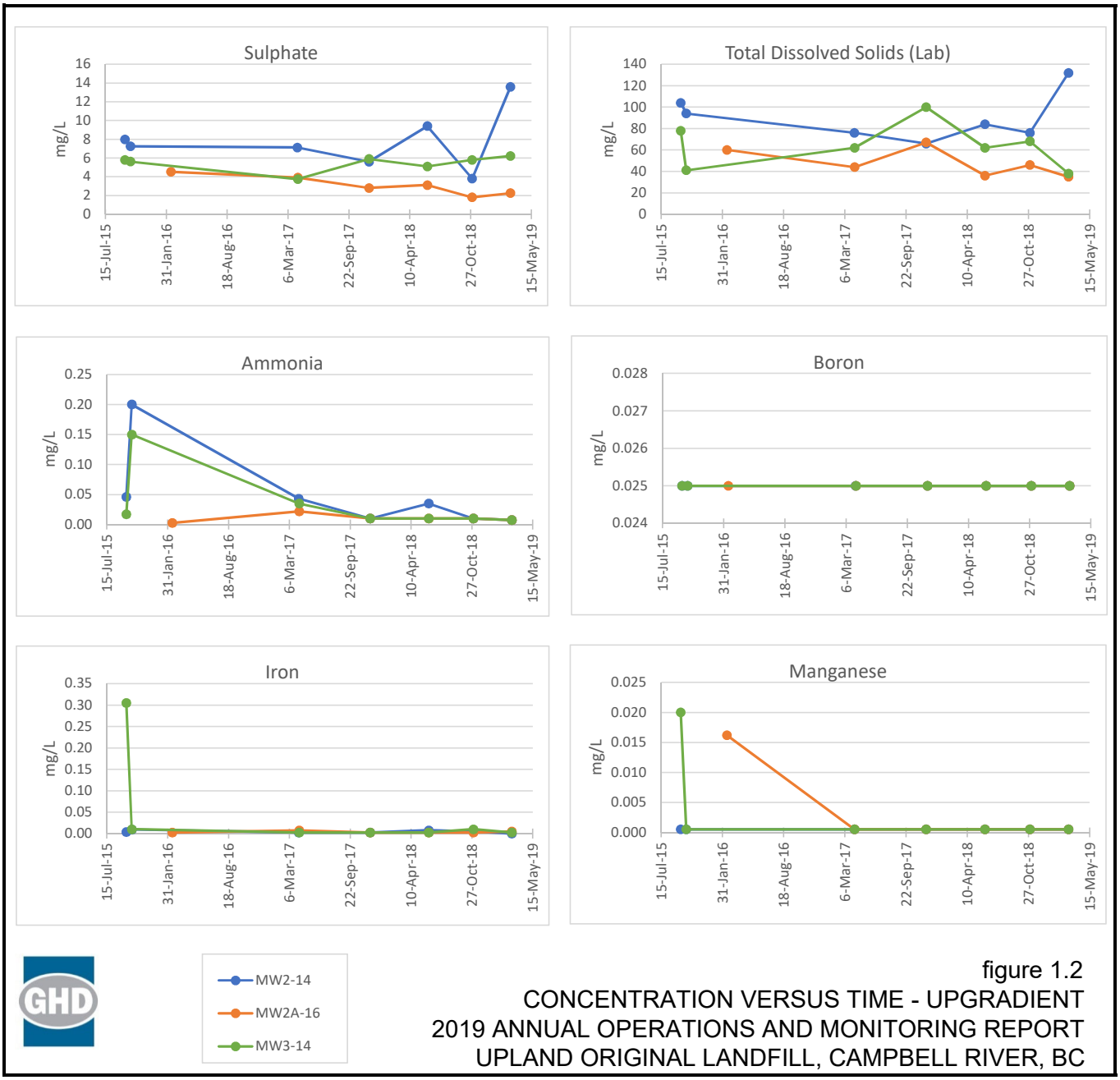


figure 1.2
CONCENTRATION VERSUS TIME - UPGRADIENT
2019 ANNUAL OPERATIONS AND MONITORING REPORT
UPLAND ORIGINAL LANDFILL, CAMPBELL RIVER, BC

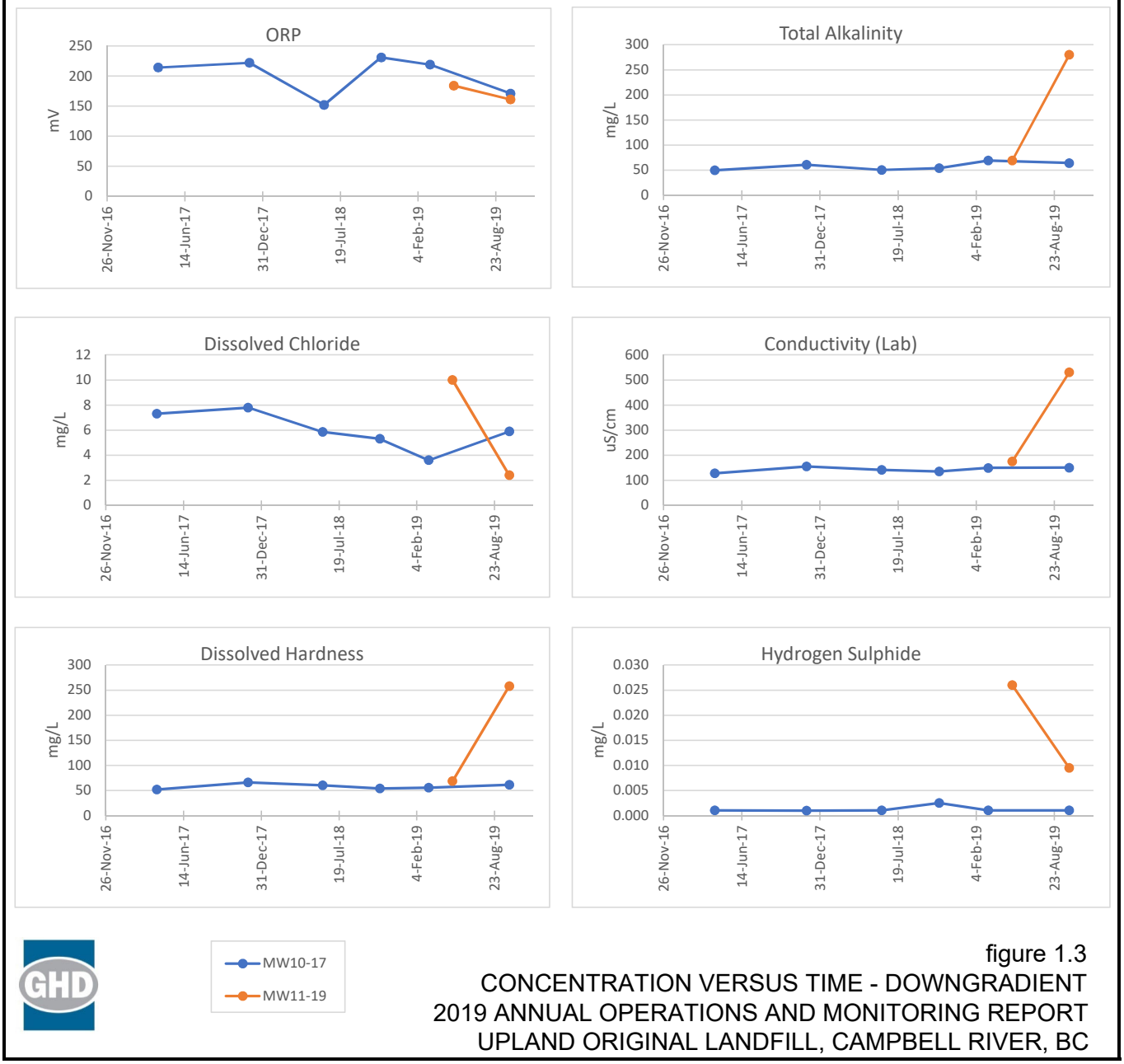


figure 1.3
CONCENTRATION VERSUS TIME - DOWNGRADIENT
2019 ANNUAL OPERATIONS AND MONITORING REPORT
UPLAND ORIGINAL LANDFILL, CAMPBELL RIVER, BC

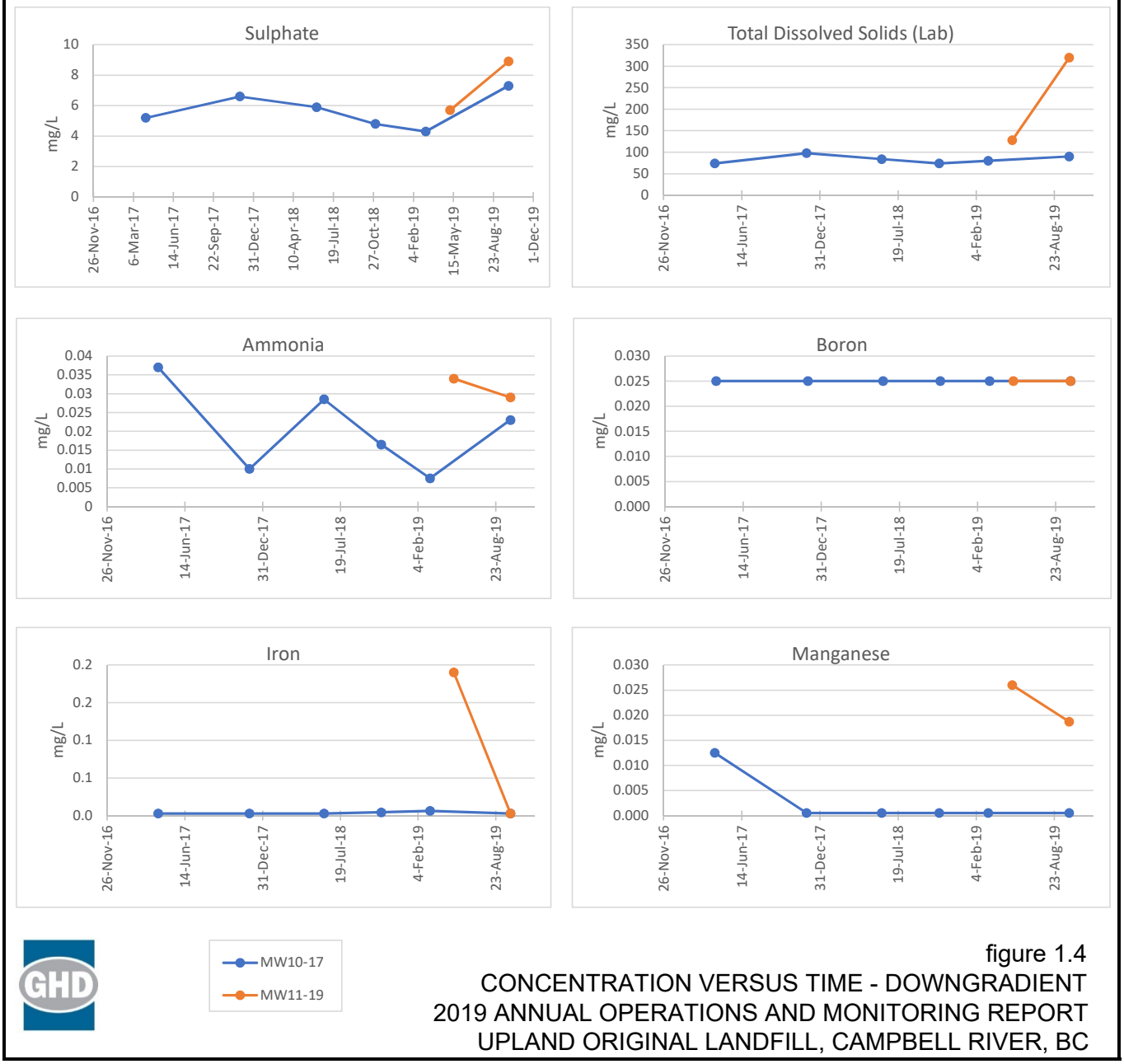
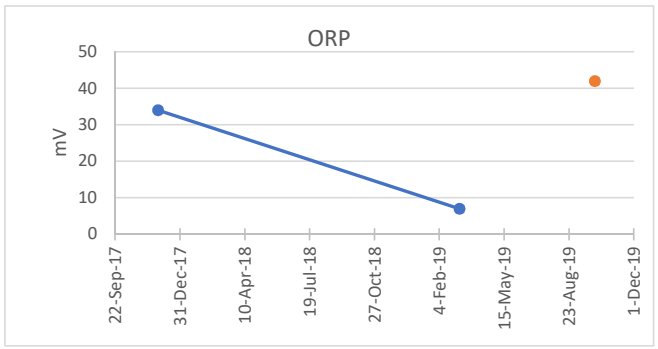
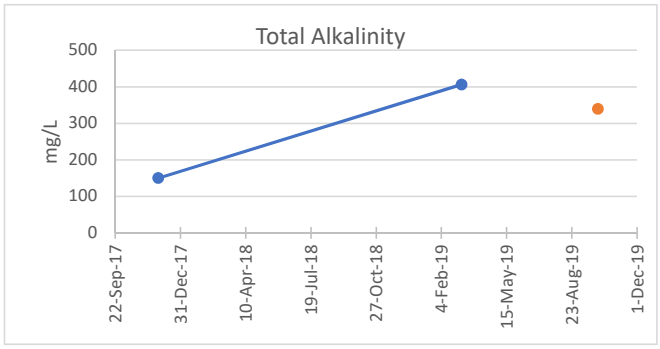
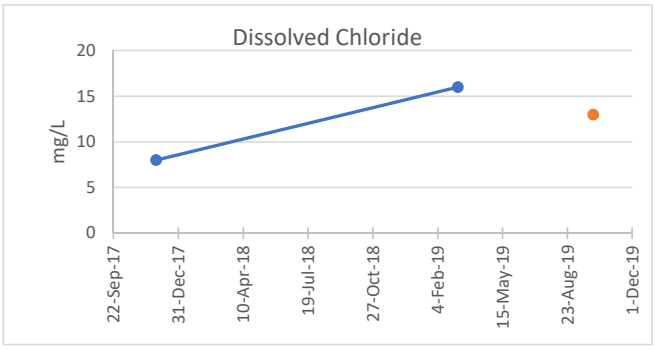
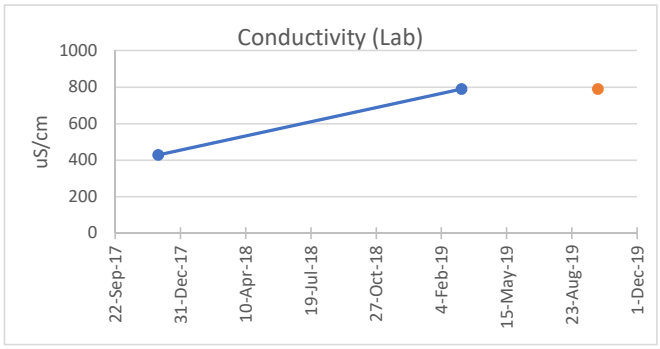


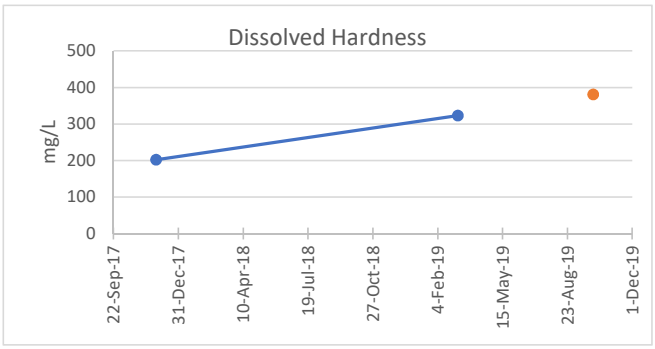
figure 1.4
CONCENTRATION VERSUS TIME - DOWNGRADIENT
2019 ANNUAL OPERATIONS AND MONITORING REPORT
UPLAND ORIGINAL LANDFILL, CAMPBELL RIVER, BC

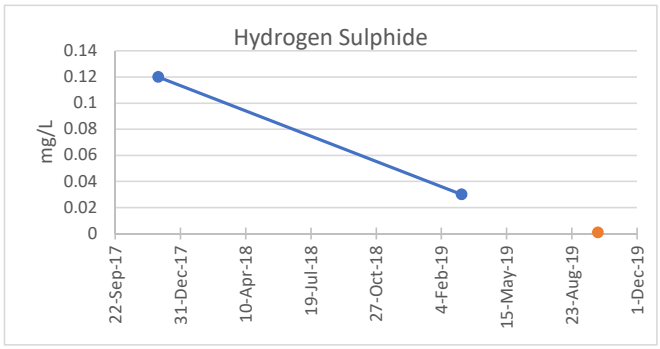












SO2-17
SO3-19

figure 1.5
CONCENTRATION VERSUS TIME - LEACHATE
2019 ANNUAL OPERATIONS AND MONITORING REPORT
UPLAND ORIGINAL LANDFILL, CAMPBELL RIVER, BC

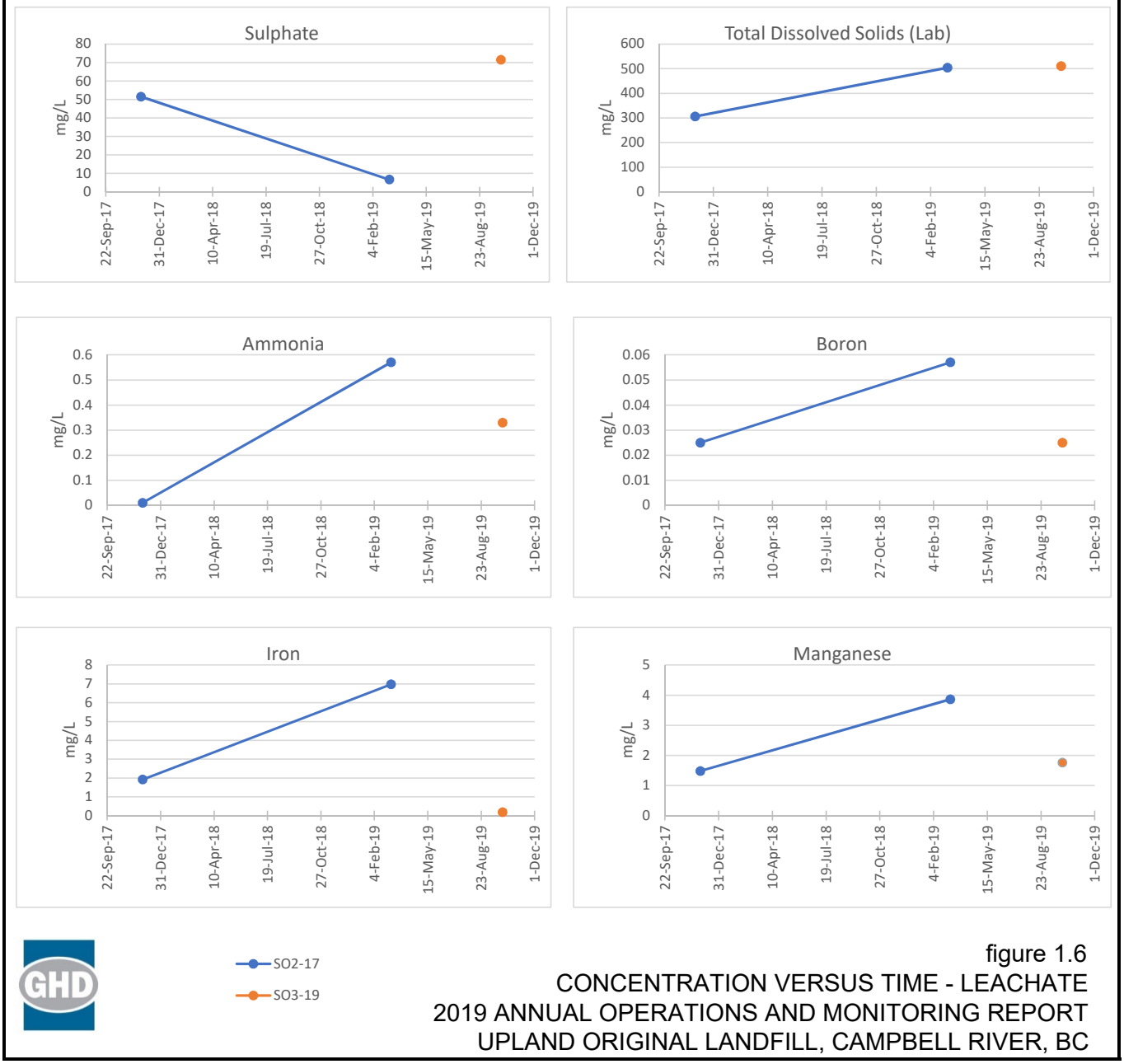


figure 1.6
CONCENTRATION VERSUS TIME - LEACHATE
2019 ANNUAL OPERATIONS AND MONITORING REPORT
UPLAND ORIGINAL LANDFILL, CAMPBELL RIVER, BC

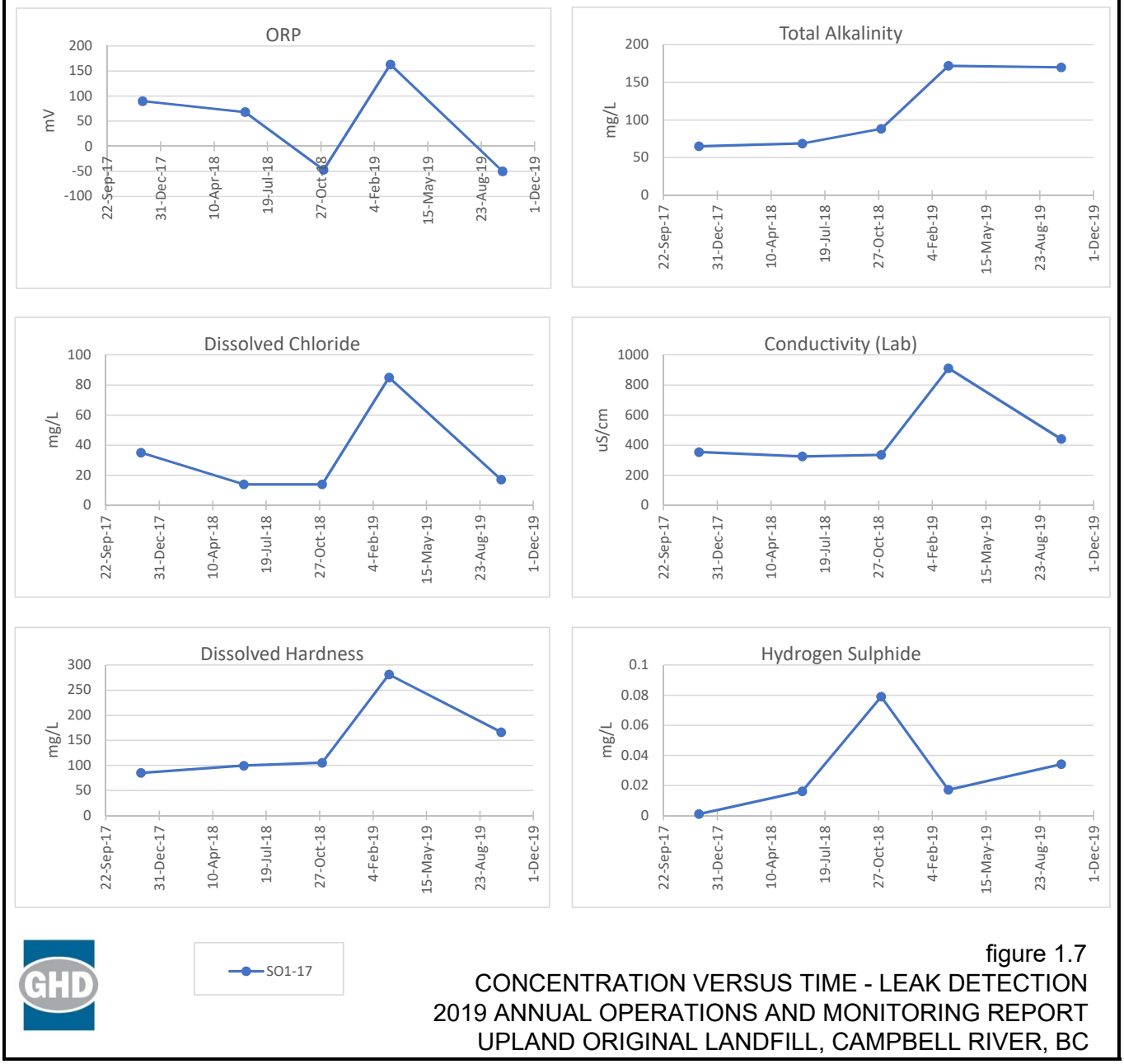
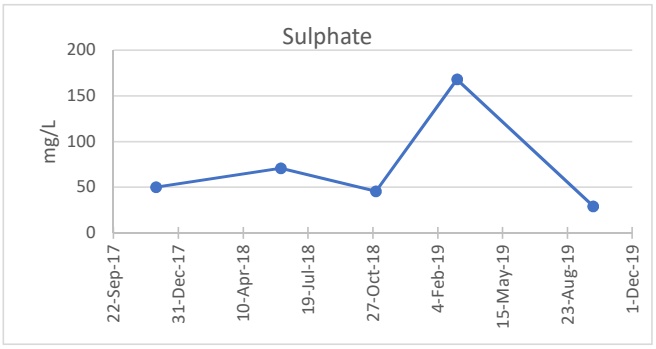
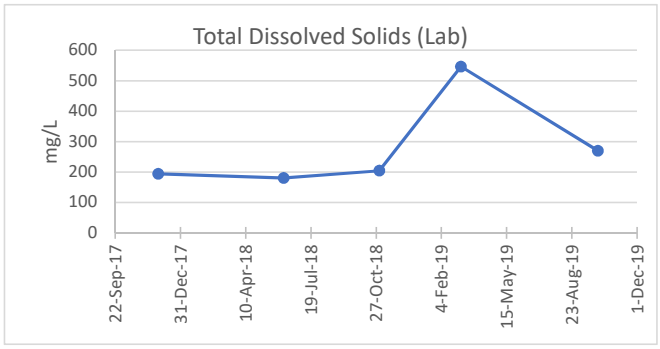
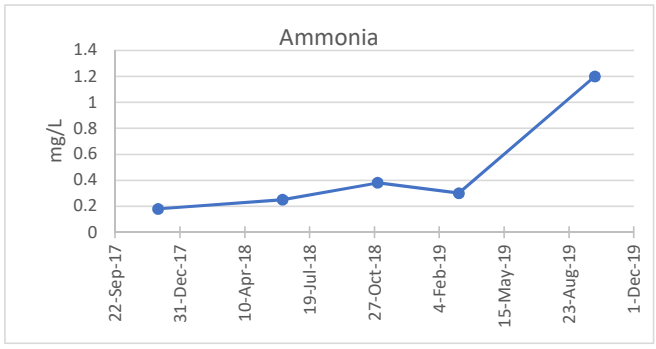
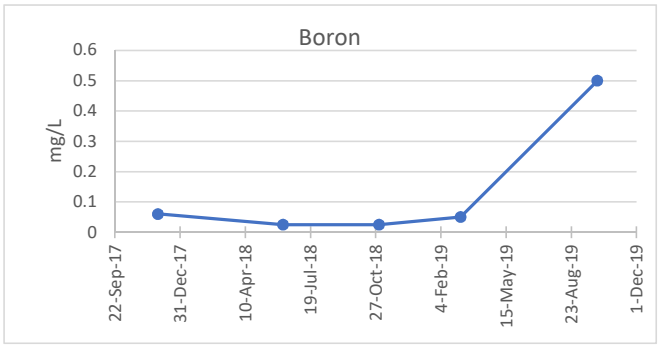


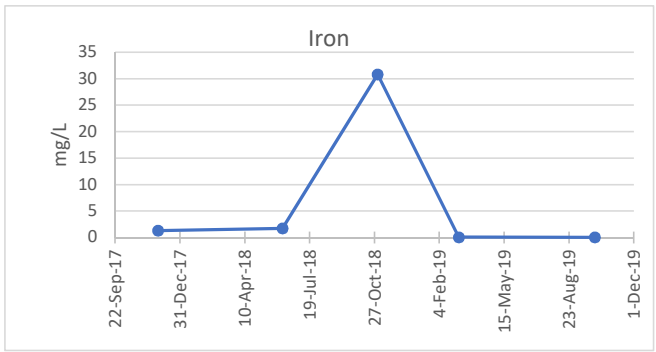
figure 1.7
CONCENTRATION VERSUS TIME - LEAK DETECTION
2019 ANNUAL OPERATIONS AND MONITORING REPORT
UPLAND ORIGINAL LANDFILL, CAMPBELL RIVER, BC











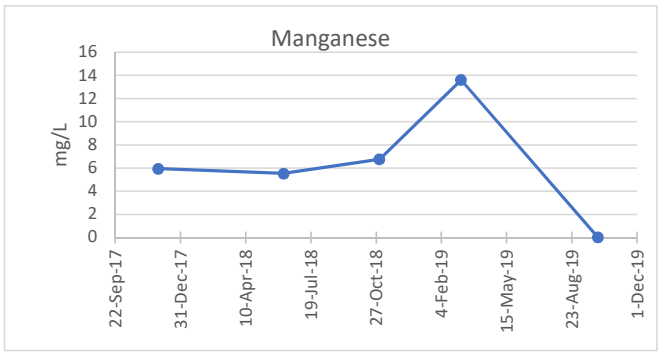


figure 1.8
CONCENTRATION VERSUS TIME - LEAK DETECTION
2019 ANNUAL OPERATIONS AND MONITORING REPORT
UPLAND ORIGINAL LANDFILL, CAMPBELL RIVER, BC

Appendix F
Annual Status Form

AUTHORIZATION NUMBER: 107689

AUTHORIZATION TYPE: Refuse, Permit

LEGAL AUTHORIZATION HOLDER NAME: Upland Excavating Ltd.

AUTHORIZED PERSON NAME: Greg Ferraro

AUTHORIZED PERSON SIGNATURE:

SIGNATURE DATE: March 31, 2019

I understand that it is an offense to mislead a government official, and I declare that all of the information presented is accurate and true.
I have been given the authority by the authorization holder to sign this form.

CONDITION NUMBER	CONDITION DESCRIPTION	COMPLIANT? (Yes/No/ND)	ACTION TAKEN
1.0	The maximum rate of waste discharge to the Original Lined Cell is 45,000 tonnes per calendar year.	Yes	N/A - Refer to Section 2.8 of the annual report.
1.1	The characteristics of the waste discharge to the Original Lined Cell must be: (a) demolition waste, (b) construction waste, (c) land clearing waste, (d) soil in which the concentrations of all substances are less than the lowest applicable industrial land use standard specified for those substances in (i) the generic numerical soil standards, (ii) the matrix numerical soil standards, or (iii) a director's interim standard for soil, referred to in section 41(1)(a) of the Contaminated Sites Regulation, B.C. Reg. 375/96, (e) sludge from the Original Leachate Management Works, or, (f) other waste as authorized in writing by the director, but does not include: (g) hazardous waste except as authorized pursuant to the Hazardous Waste Regulation, controlled waste, Attractants, and, (h) waste and/or recyclable material prohibited in writing by the director.	Yes	N/A - Refer to Section 2.5 of the annual report.
1.2	The waste discharge is authorized to the Original Lined Cell approximately located as shown on Site Plan A. Waste discharge to the Original Un-Lined Cell is not authorized.	Yes	N/A - Waste was only discharged to the Original Lined Cell. Refer to Section 2.5 of the annual report.
1.3	Authorization to discharge waste to the Original Lined Cell ceases on the earlier of: (i) the date the Original Lined Cell is filled to capacity with grades not steeper than 3H:1V (33%), (ii) the date of commencement of waste discharge to the New Landfill.	Yes	N/A - Remaining airspace. Refer to Section 2.7 of the annual report.
1.5	The operational certificate holder must ensure the Original Landfill, excluding final cover, is complete and fully operational on or before the date of issuance of this operational certificate, and at all times thereafter, until the Original Landfill is decommissioned in compliance with the plan referred to in section 2.9(a) (plan to remove all waste from the Original Landfill) of this operational certificate.	Yes	N/A
1.6	The operational certificate holder must convey the leachate from the Original Lined Cell, that is to be discharged on the Facility site, to the Original Leachate Management Works.	Yes	N/A - Refer to Section 2.6 of the annual report.
1.7	The maximum rate of treated leachate effluent discharge to the treated leachate infiltration pond is 7,139 m3 per calendar year.	Yes	N/A - Treated leachate effluent was not discharged in 2019. Refer to Section 2.2 of the annual report.
1.8	The concentration of any substance in the treated leachate effluent discharge to the treated leachate infiltration pond must not be greater than the Contaminated Sites Regulation Generic Numerical Water Standards for Drinking Water (DW), for that substance.	Yes	N/A - Treated leachate effluent was not discharged in 2019. Refer to Section 2.2 of the annual report.
1.9	The treated leachate effluent is authorized to be discharged to the treated leachate infiltration pond and infiltrated into the ground. This authorization ceases on the date the Original Leachate Management Works are decommissioned in compliance with the plan referred to in section 2.9(a) (plan to remove all waste from the Original Landfill) of this operational certificate.	Yes	N/A - treated leachate infiltration pond has yet to be constructed.
1.12	The operational certificate holder must ensure the Original Leachate Management Works are complete and fully operational on or before the date of commencement of discharge to the treated leachate infiltration pond, and at all times thereafter, until the Original Leachate Management Works are decommissioned in compliance with the plan referred to in section 2.9(a) (plan to remove all waste from the Original Landfill) of this operational certificate.	Yes	N/A - Treated leachate effluent was not discharged in 2019. Refer to Section 2.2 of the annual report.
2.2	Before a specific quantity of soil is accepted at the Facility, the operational certificate holder must cause a Qualified Professional to certify and submit to the operational certificate holder, a document pertaining to the specific quantity of soil that includes: (i) the soil tonnage(s) and soil quality class(es) as described in the most recent version of Technical Guidance 1 on Contaminated Sites Site Characterization and Confirmation Testing, (ii) the soil origin including applicable civic address, site identification number, parcel identifier, parcel identification number, legal description, and, (iii) characterization of the soil in accordance with ministry procedures and applicable Contaminated Sites Regulation Guidance, Protocols and Procedures.	Yes	N/A - Refer to Section 2.5 of the annual report.
2.5	The operational certificate holder must cause a Qualified Professional to carry out inspections before and during the construction or modification of Significant Works, and, after the completion of construction or modification of Significant Works, to certify and submit construction report(s) to the director for all Significant Works, on or before 60 days after the completion of construction or modification of the Significant Works.	Yes	N/A - Refer to Section 2.4 of the annual report.
2.6	The construction report(s) must demonstrate that the Significant Works have been constructed in accordance with this operational certificate and the applicable most recent OCP or DOCP, describe any technical concerns that arose from the inspections and testing and how they were addressed, and include as-built record drawings of the constructed Significant Works, all the inspection and testing reports and results including geologic inspection report, quality control and quality assurance testing, soil test data including field and laboratory data, as described in the Landfill Criteria section 10.2 Construction Report(s).	Yes	N/A - Leachate Management Works are under development.
2.7	The operational certificate holder must notify the director of the date of commencement of waste discharge to the Original Lined Cell, on that date.	Yes	N/A - The operational certificate holder notified the Director.
3.0	The operational certificate holder must provide and install multiple and/or spare works and auxiliary power facilities to ensure the Original Lined Cell, Original Leachate Management Works, New Landfill, New Leachate Management Works, and New Storm water Management Works, are complete and fully operational as specified in this operational certificate, including during maintenance, breakdowns and electrical power outages.	Yes	N/A - Refer to Section 2.2 of the annual report.
3.1	The operational certificate holder must cause persons that are qualified and trained to operate, regularly inspect, and maintain the Facility, in good working order. If components of the Facility have a manufacturer's recommended maintenance schedule, then those components must, at a minimum, be maintained in accordance with that schedule.	Yes	N/A
3.2	The operational certificate holder must prepare documents of the qualification and training of the persons operating, inspecting and maintaining the Facility, and of Facility inspections, operation and maintenance.	Yes	N/A
3.3	The operational certificate holder must ensure that at least one person responsible for the management of the Facility is certified, and maintains certification, by The Solid Waste Association of North America (SWANA) as a Manager of Landfill Operations, and at least one person responsible for the operation of the Facility has, within the preceding five years, successfully completed the SWANA Landfill Operations Basics course, on or before the earlier of: (i) the date of commencement of waste discharge to the Original Lined Cell, (ii) the date of commencement of waste discharge to the New Landfill, and at all times thereafter.	Yes	N/A
3.4	The operational certificate holder must prepare documents of the SWANA certification and training of the person(s) responsible for the management and operation of the Facility.	Yes	N/A
3.5	The operational certificate holder must ensure that the Facility does not cause the concentration of any substance in groundwater flowing from the Facility site boundary to be greater than: (i) the Contaminated Sites Regulation Generic Numerical Water Standards for Drinking Water (DW), for that substance, or (ii) if the local background concentration of any substance is greater than (i), the local background concentration of that substance.	Yes	N/A - Refer to Section 6.1 of the annual report.
3.11	The operational certificate holder must ensure that the Facility does not cause a nuisance including with regard to birds, rodents, insects, odour, noise, dust, litter, vector and wildlife attraction.	Yes	N/A - Refer to Section 2.11 of the annual report.
3.12	The operational certificate holder must prepare documents of complaints with regard to matters relevant to this operational certificate, including environmental and nuisance complaints. These documents must include the source and nature of the complaint, actions, responses, and corresponding dates and times.	Yes	N/A - Refer to Section 2.11 of the annual report.
4.0	Sampling Procedures The operational certificate holder must carry out required sampling in accordance with the procedures described in the "British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples, 2013 Edition (Permittee)" or most recent edition, or by alternative procedures as authorized by the director.	Yes	N/A - Refer to Section 4.3 of the annual report.
4.1	Analytical Procedures The operational certificate holder must carry out required analyses in accordance with procedures described in the "British Columbia Laboratory Manual (2015 Permittee Edition)", or the most recent edition or by alternative procedures as authorized by the director.	Yes	N/A - Refer to Sections 4.3 and 4.4 of the annual report.
4.2	The operational certificate holder must obtain from the analytical laboratory(ies) their precision, accuracy and blank data for each sample set submitted by the operational certificate holder and an evaluation of the data acceptability, based on criteria set by such laboratory.	Yes	N/A - Refer to Sections 4.4 of the annual report.
4.3	The operational certificate holder must submit samples to analytical laboratory(ies) that meet the definition of a qualified laboratory under the Environmental Data Quality Assurance Regulation.	Yes	N/A - Refer to Sections 4.3 and 4.4 of the annual report.
4.4	The operational certificate holder must collect, prepare and submit for analysis by the analytical laboratory(ies) quality control (QC) samples for each parameter. As a minimum, the number of QC samples should be 20% of all samples collected (environmental + QC samples) within 48 hours of each other, and include duplicate, field and trip blank samples for each parameter.	Yes	N/A - Refer to Sections 4.5, 4.5 and AppB of the annual report.
5.1	The operational certificate holder must immediately notify the director or designate by email at EnvironmentalCompliance@gov.bc.ca, or as otherwise instructed by the director of any non-compliance with the requirements of this authorization by the operational certificate holder and must take remedial action to remedy any effects of such non-compliance.	Yes	N/A - No non-compliances. Refer to Section 2.10 of the annual report.
5.2	The operational certificate holder must provide the director with written confirmation of all non-compliance events, including available test results within 24 hours of the original notification by email at EnvironmentalCompliance@gov.bc.ca, or as otherwise instructed by the director.	Yes	N/A - No non-compliances. Refer to Section 2.10 of the annual report.
5.3	If the operational certificate holder fails to comply with any of the requirements of this authorization, the operational certificate holder must, within 30 days of such non-compliance, submit to the director a written report that is satisfactory to the director and includes, but is not necessarily limited to, the following: (i) all relevant test results obtained by the operational certificate holder related to the non-compliance, ii) an explanation of the most probable cause(s) of the non-compliance, and (iii) a description of remedial action planned and/or taken by the operational certificate holder to prevent similar non-compliance(s) in the future.	Yes	N/A - No non-compliances. Refer to Section 2.10 of the annual report.
5.4	The operational certificate holder must submit all non-compliance reporting required to be submitted under this section by email to the Ministry's Compliance Reporting Submission Mailbox at EnvironmentalCompliance@gov.bc.ca or as otherwise instructed by the director.	Yes	N/A - No non-compliances. Refer to Section 2.10 of the annual report.
5.5	The operational certificate holder must cause a Qualified Professional to certify and submit an Annual Operations and Monitoring Report in a format suitable for public release, for the preceding calendar year, to the director on or before March 31 of each year. On or before March 31 of each year, the operational certificate holder must post a copy of the Annual Operations and Monitoring Report online, on a website accessible to the public, and in accordance with any requirements of the director.	Yes	N/A - 2019 annual report submitted on March 31, 2019.
5.6	The Annual Operations and Monitoring Report must include a summary of OCP implementation that addresses the information in section 2.3(b), and summary of DOCP implementation that addresses the information in 2.5(b), of this operational certificate.	Yes	N/A - Refer to section 2.3 of the annual report.

CONDITION NUMBER	CONDITION DESCRIPTION	COMPLIANT? (Yes/No/ND)	ACTION TAKEN
5.7	The Annual Operations and Monitoring Report must include a summary of construction reports.	Yes	N/A - Refer to section 2.4 of the annual report.
5.8	The Annual Operations and Monitoring Report must include annual and cumulative tonnages and categories of waste including soil tonnage(s) and soil quality class(es) discharged to the Original Lined Cell and to the New Landfill.	Yes	N/A - Refer to section 2.6 of the annual report.
5.9	The Annual Operations and Monitoring Report must include remaining volume and life of the Original Lined Cell and of the New Landfill.	Yes	N/A - Refer to section 2.8 of the annual report.
5.10	The Annual Operations and Monitoring Report must include a summary of treated leachate effluent quantity and quality discharged to the treated leachate infiltration pond.	Yes	N/A - Refer to section 5.3 of the annual report.
5.11	The Annual Operations and Monitoring Report must include a summary of complaints and nuisances and description of remedial action planned and/or taken by the operational certificate holder to prevent similar complaints and nuisances in the future.	Yes	N/A - Refer to section 2.11 of the annual report.
5.12	The Annual Operations and Monitoring Report must include a summary of non-compliance notifications and non-compliance reporting and description of remedial action planned and/or taken by the operational certificate holder to prevent similar non-compliance(s) in the future.	Yes	N/A - Refer to section 2.11 of the annual report.
5.13	The Annual Operations and Monitoring Report must include an annual status form in accordance with the instructions and template at the ministry website https://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/data-and-report-submissions/annual-status-form	Yes	N/A - Refer to this form (Appendix G of the annual report).
5.14	The Annual Operations and Monitoring Report must include a summary of OCP and DOCP implementation, and construction of Significant Works, planned for the next calendar year.	Yes	N/A - Refer to sections 2.3 of the annual report.
5.15	The Environmental Monitoring Plan Report must include site plan(s), sampling locations, storm water flow paths, groundwater elevations, gradients and flow directions.	Yes	N/A - Refer to Figures of the annual report.
5.16	The Environmental Monitoring Plan Report must include data including laboratory analysis and quality assurance and quality control results.	Yes	N/A - Refer to Appendices C and D of the annual report.
5.17	The Environmental Monitoring Plan Report must include data tabulation, trend analysis, graphs, diagrams, and interpretation.	Yes	N/A - Refer to Tables and AppE of the annual report.
5.18	The Environmental Monitoring Plan Report must include trigger level assessment plan monitoring, data, results and interpretation.	Yes	N/A - A trigger level assessment plan is not needed for the Original Lined Cell.
5.19	The Environmental Monitoring Plan Report must include any determination(s) of the local background concentration of substance(s) in accordance with section 3.5 of this operational certificate.	Yes	N/A - Local determination(s) on local background concentration of substances was not needed.
5.20	The Environmental Monitoring Plan Report must include comparison of the data with the standards for treated leachate effluent discharge, storm water quality, groundwater quality, and landfill gas management, specified in sections 1.2, 1.4, 1.5, 3.5 and 3.6 of this operational certificate, and identification of any non-compliance and predicted future non-compliance.	Yes	N/A - Refer to sections 5 and 6 of the annual report.
5.21	The Environmental Monitoring Plan Report must include results, conclusions, recommendations and changes to the environmental monitoring plan.	Yes	N/A - Refer to sections 7 and 8 of the annual report.
5.22	The operational certificate holder must upload monitoring data associated with this operational certificate to the Ministry's Environmental Monitoring System (EMS) database, within 45 days of the end of the 3 month period in which the data is collected.	Yes	N/A - Currently working with the ENV to upload data to the EMS.

about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

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